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Number 4

Mariners Weather Log

National Oceanic and Atmospheric Administration • National Environmental Satellite, Data, and Information Service • National Oceanographic Data Center

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Mariners Weather Log

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Front Cover: The British sailing ship MARQUES sails past the Canadian destroyer ASSINIBOINE and the starting line of the Tall Ship race off St. George Bermuda June 2. She was caught in heavy seas on the 3rd and sank. Wide World Photo

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 1, 1985.

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Mariners Weather Log

WESTERN NORTH PACIFIC TYPHOONS, 1983

Extracted from the Annual Tropical Cyclone Report, 1983, U.S. Naval Oceanographic Command Center, Joint Typhoon Warning Center, Guam, Mariana Islands.

During 1983, the western North Pacific experience the fifth consecutive year of below average tropical cyclone activity. Twenty-five tropical cyclones occurred in 1983, six and one-half less than the annual average. Only two significant tropical cyclones failed to develop beyond the tropical depression (TD) stage and eleven tropical storms (TS) failed to reach typhoon intensity. Of the 12 tropical cyclones that developed to typhoon (TY) intensity, four reached the 130 kn intensity necessary to be classified as super typhoons (STY). In the western North Pacific, tropical cyclones reaching tropical storm intensity or greater are assigned names in alphabetical order from a list of alternating male/female names (see table at the end of this article). Table 1 provides a summary of key statistics for western North Pacific tropical cyclones. Each tropical cyclone's maximum surface wind (in knots) and minimum observed sea-level pressure (in millibars) were obtained from best estimates based on all available data. Thedistance traveled (in nautical miles) was calculated from Joint Typhoon Warning Center (JTWC) official best tracks.

Tables 2 through 4 provide further information on the monthly distribution of tropical cyclones and statistics on tropical cyclone formation and warnings.

Figures 1 through 4 show the tracks of the individual cyclones from first detection until dissipation or becoming extratropical. In the tables the storms are credited to the month that the first warning was issued. Maximum winds are estimates of 1-min average sustained speeds.

Individual typhoons are described in the following narratives. Times are GMT unless

Table 1.--Tropical cyclones, western North Pacific, 1983

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WINDS (KT)	OBSERVED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
01W TS SARAH	24 JUN - 26 JUN	3	6	35	999	1948
02C TC 02C	31 AUG - 2 SEP	3	5	30	1010	773
02W TY TIP	10 JUL - 13 JUL	4	14	65	978	1206
03W TY VERA	12 JUL - 18 JUL	7	25	90	952	2546
04W STY WAYNE	22 JUL - 25 JUL	4	14	135	920	1739
05W STY ABBY	5 AUG - 17 AUG	13	51	145	888	2031
06W TS CARMEN	12 AUG - 15 AUG	4	11	45	992	1186
07W TS BEN	12 AUG - 15 AUG	4	12	50	989	968
08W TS DOM	19 AUG - 26 AUG	8	23	55	995	1859
09W TD 09W	26 AUG - 27 AUG	2	4	30	996	622
10W TY ELLEN	29 AUG - 9 SEP	12	47	125	928	4462
11W STY FORREST	20 SEP - 29 SEP	10	32	150	883	2191
12W TS GEORGIA	29 SEP - 1 OCT	3	11	55	987	825
13W TS HERBERT	7 OCT - 8 OCT	2	8	50	987	445
14W TY IDA	7 OCT - 11 OCT	5	15	65	973	1889
15W TY JOE	10 OCT - 13 OCT	4	15	65	975	1654
16W TS KIM	16 OCT - 20 OCT	5	3	40	993	1224
17W TY LEX	22 OCT - 26 OCT	5	18	70	971	718
18W STY MARGE	31 OCT - 7 NOV	8	27	145	896	2370
19W TS NORRIS	9 NOV - 11 NOV	3	7	50	994	721
20W TY ORCHID	17 NOV - 27 NOV	11	38	125	928	2214
21W TY PERCY	19 NOV - 24 NOV	6	23	70	970	1123
22W TS RUTH	23 NOV - 30 NOV	8	16	60	993	1615
23W TS SPERRY	2 DEC - 5 DEC	4	10	55	990	970
24W TS THELMA	16 DEC - 18 DEC	3	10	55	990	1170
	1983 TOTALS:	111*	445			

* OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM

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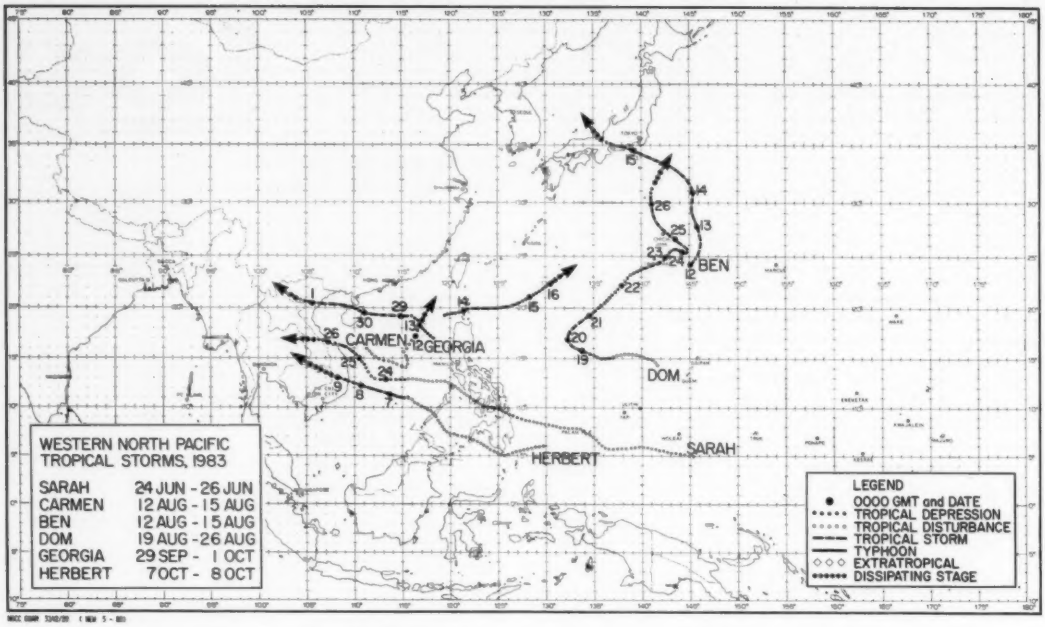


Figure 1.-- Tropical storm tracks, 1983.

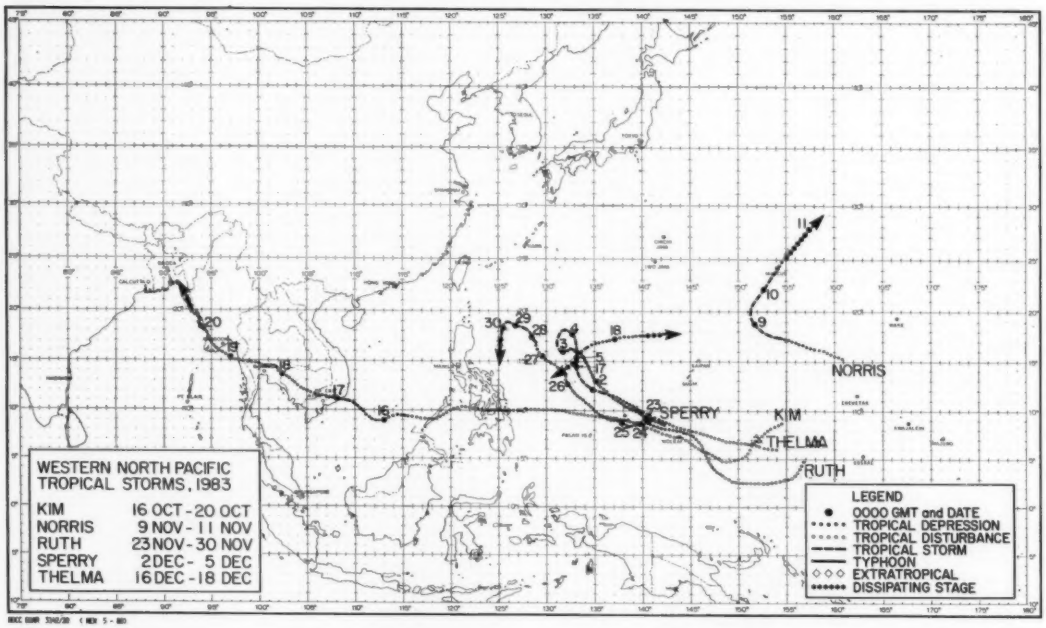


Figure 2.-- Tropical storm tracks, 1983.

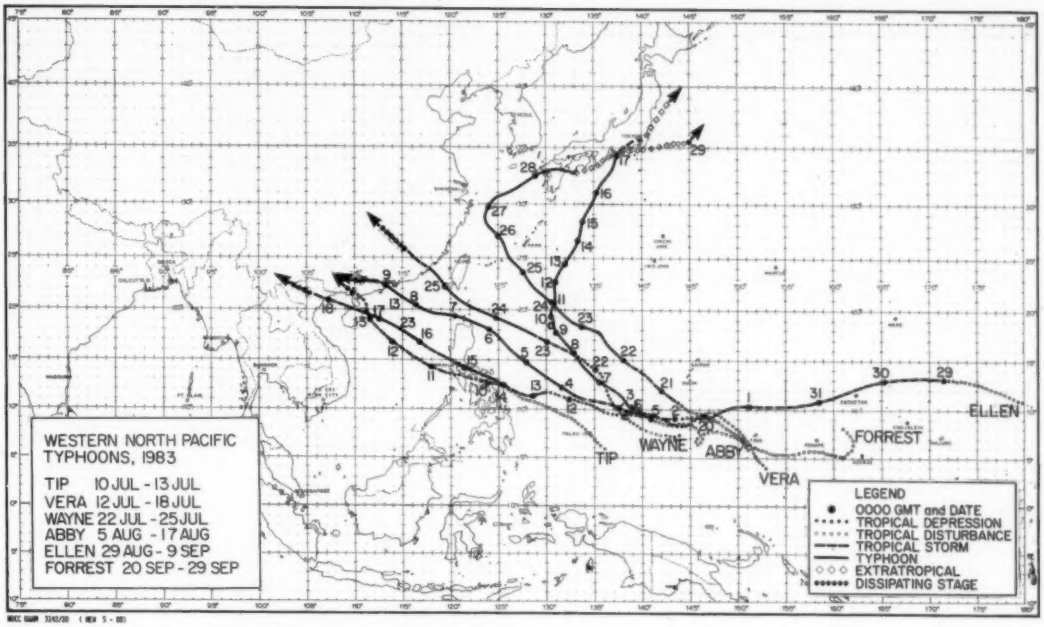


Figure 3.-- Typhoon tracks, 1983.

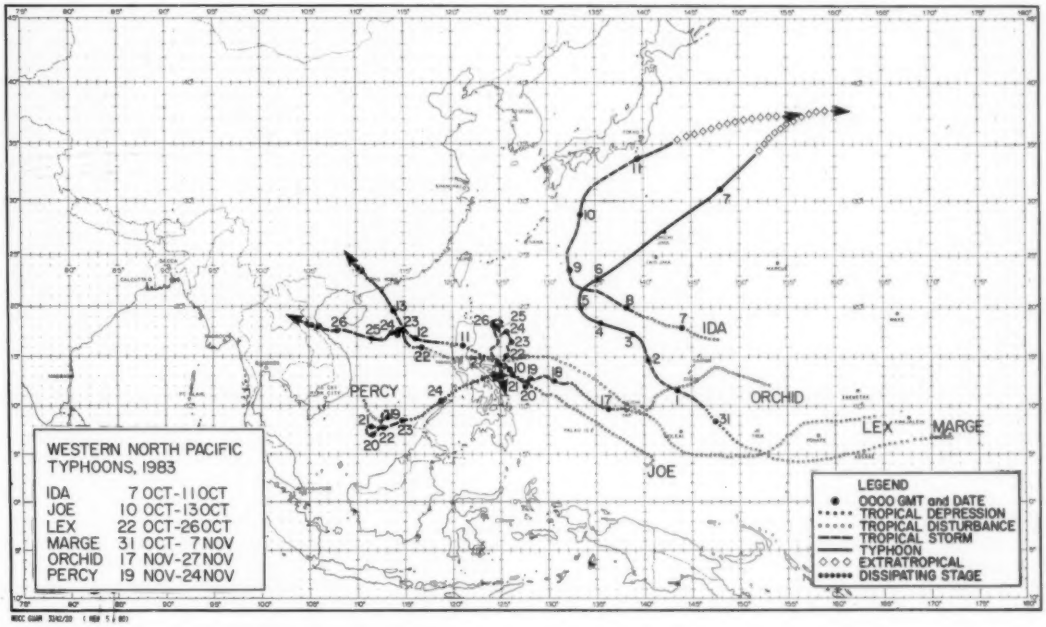


Figure 4.-- Typhoon tracks, 1983.

Table 2.-- 1983 tropical cyclone statistics

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	(1959-1982) AVERAGE	CASES
TROPICAL DEPRESSIONS	0	0	0	0	0	0	0	2	0	0	0	0	2	3.9	93
TROPICAL STORMS	0	0	0	0	0	1	0	3	1	2	2	2	11	9.7	232
TYPHOONS	0	0	0	0	0	0	3	2	1	4	2	0	12	17.8	428
ALL TROPICAL CYCLONES	0	0	0	0	0	1	3	7	2	6	4	2	25	31.4	753
1959-1982														PREVIOUS	
AVERAGE	.5	.3	.8	.9	1.4	2.0	5.0	6.2	5.9	4.4	2.6	1.4	31.4	24-YEAR	
CASES	13	8	22	23	40	119	149	162	165	63	33	753		HISTORY	

FORMATION ALERTS: 25 of 31 Formation Alerts developed into significant tropical cyclones. Tropical Cyclone Formation Alerts were issued for all significant tropical cyclones that developed during 1983.

WARNINGS:
Number of warning days: 111
Number of warning days with two tropical cyclones in region: 18
Number of warning days with three or more tropical cyclones in region: 6

Table 3.-- Frequency of typhoons by month and year

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.3	.4	.7	1.1	2.0	2.9	3.2	2.4	2.0	.9	16.3
1959	0	0	0	1	0	0	1	5	3	3	2	2	17
1960	0	0	0	1	0	2	2	0	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	0	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	1	0	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	0	1	1	4	4	3	4	2	22
1973	0	0	0	0	0	0	0	4	2	2	4	0	12
1974	0	0	0	0	1	2	1	2	3	4	2	0	14
1975	1	0	0	0	0	0	0	1	3	4	1	2	15
1976	1	0	0	1	2	2	2	1	4	1	1	0	15
1977	0	0	0	0	0	0	1	0	2	1	2	1	11
1978	0	0	0	1	0	0	1	2	4	1	2	0	15
1979	1	0	1	1	0	0	2	2	3	2	1	1	14
1980	0	0	0	0	2	0	1	2	5	2	1	0	15
1981	0	0	1	0	0	2	2	2	4	1	2	2	16
1982	0	0	2	0	1	1	2	5	3	3	1	1	19
1983	0	0	0	0	0	0	3	2	1	4	2	0	12
(1959-1983) AVERAGE	.2	.04	.2	.6	.8	.9	2.0	3.3	3.2	3.0	1.6	.6	17.4
CASES	5	1	5	15	20	23	49	81	80	74	40	15	435

otherwise indicated. Tropical storm summaries may be found in Hurricane alley of the appropriate issue of the MARINERS WEATHER LOG.

TYPHOON TIP

During late June and early July several tropical disturbances were monitored by JTWC. All of these with the exception of tropical storm Sarah (01W), originated in the Philippine Sea and moved westward without developing into significant tropical cyclones. The combination of the rugged Philippine terrain and strong upper-level flow in the South China Sea was sufficient deterrent to development.

On 8 July another disturbance became evident in the Philippine Sea as a persistent area of convective activity near 8°N, 134°E. Synoptic data indicated that the disturbance was poorly organized with an (MSLP) of 1008 mb.

On the following day, the disturbance was located near 11°N,129°E and appeared somewhat more organized on satellite imagery. A weather reconnaissance aircraft on an investigative mission east of Samar was unable to locate a closed circulation, but found a broad area of low presures with maximum surface winds of 25 kn and MSLP of 1004 mb. In spite of the apparent absence of a well defined surface circulation, a (Tropical Cyclone Formation Alert (TCFA) was issued on 09/0841. The alert was issued because the disturbance was entering an area of strong upper-level divergence associated with a Tropical

Table 4.-- Frequency of tropical storms and typhoons by month and year.

TABLE 3-4.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.4	.1	.4	.5	.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	21.6
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
1976	1	1	0	2	2	2	4	4	5	1	1	2	25
1977	0	0	1	0	0	1	4	1	5	4	2	1	19
1978	1	0	0	1	0	3	4	7	5	4	3	0	28
1979	1	0	1	1	1	0	4	2	7	3	2	2	24
1980	0	0	0	1	4	1	4	2	6	4	1	1	24
1981	0	0	1	2	0	2	5	7	4	2	3	2	28
1982	0	0	3	0	1	3	4	5	5	3	2	1	26
1983	0	0	0	0	0	1	3	5	2	5	5	3	33
(1959-1983) AVERAGE	.5	.3	.6	.8	1.2	1.6	4.4	5.4	4.9	4.0	2.5	1.2	27.3
CASES	12	7	14	21	29	40	111	135	122	100	62	30	683

Upper Tropospheric Trough (TUTT) cell to the northeast. JTWC continued to monitor this disturbance as it moved rapidly across the Philippines, however synoptic data from philippine land stations indicated that the disturbance remained loosely organized.

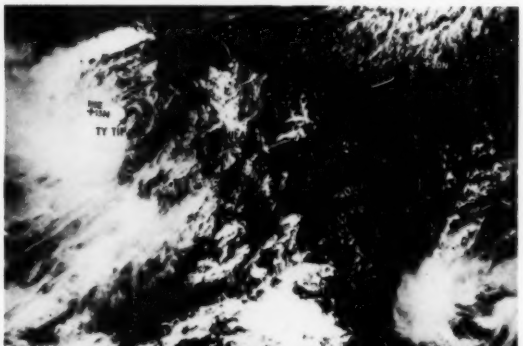


Figure 5.-- Typhoon Tip at 0644 on the 11th at maximum intensity. NOAA IMAGE

The first warning was issued as the disturbance, now tropical depression 02W, entered the South China Sea north of Mindoro. Synoptic data indicated the presence of a well defined surface circulation with 30 kn winds and minimum sea-level pressure (MSLP) of 998 mb. From the initial warning, movement to the northwest toward Hainan Island was forecast, with continued intensification and then weakening late in the period. This forecast scenario was based on the expectation that the mid-level easterly steering currents and strong vectical shear in the area would persist through the forecast period.

Tip lived up to expectations, moving as expected and achieving typhoon intensity at 11/1200. Figure 5 shows Tip near maximum intensity on the 11th. The effects of the strong upper-level flow are apparent as Tip

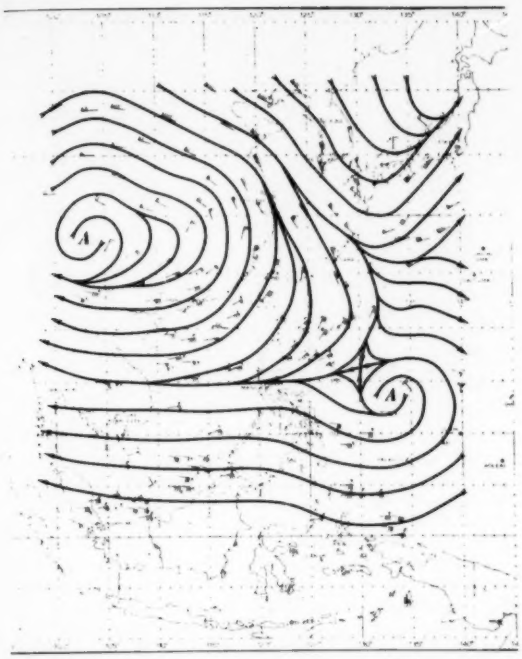


Figure 6.-- The 200 mb analysis at 1200 on the 11th.

appears as an exposed low-level circulation with its convection displaced to the southwest. The circulation appearing on the right hand side of the picture is the disturbance which later developed into typhoon Vera (03W). Figure 6 is the 200 mb analysis for the area at the time of Tip's maximum intensity. Note the strong northeasterly flow over Tip and the divergent area in which Tip formed to the east.

After attaining maximum intensity of 65 kn on the 11th, Tip continued to move northwestward and weakened as an exposed low-level circulation. Tip made landfall near Chan Chiang, China on the 13th with maximum sustained winds of 30 kn and dissipated rapidly over land.

TYPHOON VERA

In the week that preceded the development of typhoon Vera, the monsoon trough extended eastward from the Philippines to 160°E as a nearly continuous zone of light surface winds and unorganized convection. However, on 4 July, surface westerlies increased to 15 kn south of the trough and one circulation center, located near Truk Atoll became a persistent feature on JTWC gradient-level charts. A noticeable change in convective activity was observed on 8 July, as two distinct cloud masses began to develop within the monsoon trough. This change occurred as two upper-tropospheric cyclones intensified over the Philippine Sea, one east of Luzon about 125°E and the other west of Guam about 140°E. The upper cyclones increased the upper-level divergence near both convective disturbances and were instrumental in sustaining the development of each during the subsequent 3 day period. The western-most disturbance became typhoon Tip (02W) and the disturbance which moved northwestward from the Truk area became typhoon Vera.

The first of two TCFAs on Vera was issued at 10/0600, when satellite imagery and 200-mb wind data indicated that a well defined upper-level circulation had developed over the system. Development of a well-defined surface circulation was slow and the formation alert was reissued at 11/0600 after reconnaissance aircraft investigative mission could not locate a circulation center in the low-level wind field. Twenty-four hours later, the initial warning was issued for tropical depression 03W when data from the next reconnaissance aircraft mission indicated a closed surface circulation with 30 kn winds and a 1004-mb central sea-level pressure.

During the first 36 hr in warning status, Vera intensified quite rapidly and reached typhoon strength by 1800 July 13. During this period, Vera slowed from an average speed of 12 kn to less than 6kn. In fact, during one 12-hr. period 12/1200 to13/0000, virtually all fix positions were within a 30 mi area. On 13 July, Vera turned toward the west-northwest and the central Philippines. Vera skirted the northeastern portion of the island of Samar at 14/0000, with mazimum sustained surface winds near 75 kn. Figure 7 shows typhoon Vera as it entered the Philippines near the island of Samar.

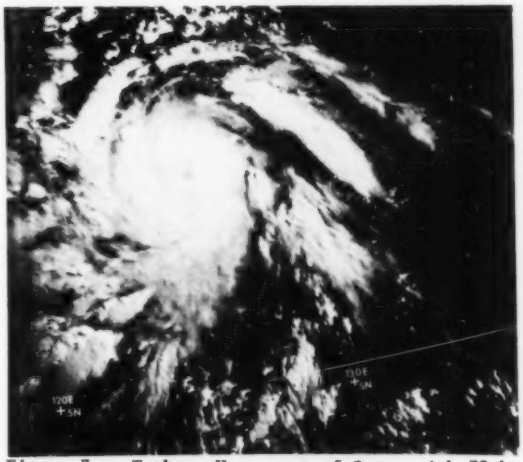


Figure 7.-- Typhoon Vera east of Samar with 70-kn winds at 2252 on the 13th. NOAA IMAGE

Forecasts from this point forward anticipated that Vera would weaken as it tracked through the Philippines. However, satellite imagery continued to indicate an increase in Vera's central cloud features until it reached the rugged terrain east of Manila. Vera then moved into Manila Bay, packing winds near 60 kn and brought extensive flooding into low-lying areas of the Bay, especially on Corregidor. Vera passed just southwest of the Naval Air Station, Cubi Point, at 15/0630 and into the South China Sea. In its wake, Vera left thousands homeless, nearly 100 people dead, and

extensive property damage to the southern two-thirds of Luzon.

Track forecasts for Vera were quite good except for an anticipated turn northward as the system moved into the South China Sea. The forecast northward track never materialized and Vera persisted on its west-northwestward track.

On 17 July, as Vera approached Hai-Nan Island, a peak intensity of 90 kn was attained. Crossing Hai-Nan and moving into the northern portion of the Gulf of Tonkin, Vera slowly weakened before making landfall near Haiphong, Vietnam, on the 18th. It then weakened rapidly over the mountainous terrain of northern Vietnam.

SUPER TYPHOON WAYNE

Cyclogenesis of super typhoon Wayne began in an elongated east-west surface trough west of Truk. Satellite imagery on 19 July indicated a widespread area of poorly organized convective activity supported by a weak upper-level anticyclone. This area remained poorly developed until 1200 on the 21st when satellite imagery indicated the development of an upper trough northwest of the system. This served to support the development of the upper-level anticyclone. Subsequent satellite imagery indicated an increase in the organization and convective activity of the system. Initial aircraft reconnaissance early on the 22d revealed a weak tropical depression with an MSLP of 1005 mb and maximum surface winds of 25 kn. The first warning on Wayne was issued shortly thereafter.

During the next 24 hrs, Wayne more than doubled in intensity to 65 kn and began to track northwestward. Aircraft reconnaissance reported very high 700-mb heights just prior to entering the eyewall of Wayne, followed by an extremely sharp pressure gradient on penetration to the center of the system. Wayne continued to ntensify rapidly, again doubling in intensity over a 24-hr period as it moved westward along the southern periphery of the subtropical ridge. Maximum intensity of 135 kn occured at 0600 on the 24th only 2 days after the first warning on the system as a tropical depression.

Wayne's rapid intensification is evident in figure 8. Note the generally good agreement between Dvorak intensity estimates and those from

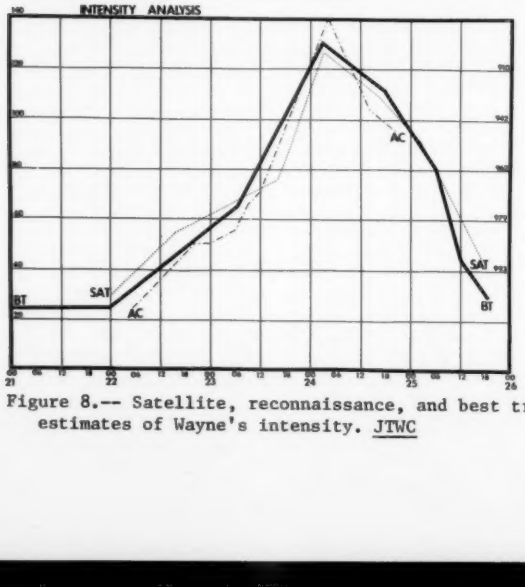


Figure 8.-- Satellite, reconnaissance, and best track estimates of Wayne's intensity. JTWC

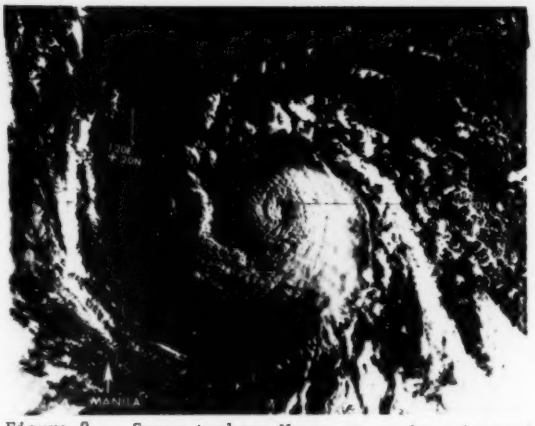


Figure 9.-- Super typhoon Wayne at maximum intensity of 135 kn.

reconnaissance aircraft. Figure 9 shows Wayne near maximum intensity with a well-developed anticyclone and gravity waves evident in the cloud features near the eye.

As super typhoon Wayne passed north of Luzon, the low-level surface flow was disrupted north of the storm by the topography of Taiwan, setting up a leeside trough in the Formosa Straits. Wayne responded to this trough, taking a more northward track and making landfall approximately 300 mi east of Hong Kong, Wayne struck the coast of China at typhoon strength, but rapidly dissipated as it moved inland over the mountainous terrain of southeastern China.

JTWC was successful in forecasting Wayne's track westward, but encountered problems forecasting speed of movement, and intensity, which went from 25 kn to 35 kn in just 48 hrs. Wayne's rapid intensification was a product of well defined outflow channels to the northeast and southwest.

Although Wayne did not make landfall in the Philippines, high winds and torrential rainfall associated with its peripheral circulation brought destruction to areas far removed from the center. At least 20 people were killed and more than 100 were reported missing when a bridge collapsed 300 mi southeast of Manila.

SUPER TYPHOON ABBY

The tropical disturbance which eventually developed into the second super typhoon of the season was first detected on satellite imagery on 31 July as an area of enhanced convective activity to the southeast of Guam. This disturbance was located near 6°N, 152°E in close proximity to an upper-level anticyclone. Surface data indicated that a weak surface circulation was centered approximately three degrees to the north of the area of convection. Over the next 9 days, this circulation developed into an intense super typhoon with maximum sustained winds of 145 kn and a massive circulation which was the dominant synoptic feature in the western Pacific. Abby's huge circulation system provided the environment for the development of tropical storm Ben, and eventually caused the dissipation of Ben and another tropical storm (Carmen).

The first 4 days of Abby's development were unimpressive. The disturbance was monitored closely during this period as it moved slowly westward south of Guam. No consistent increase in organization was apparent until 3 August. A weather reconnaissance aircraft was launched early on the 4th but it was unable to close off a surface circulation even though several hours wewe spent investigating the suspect area. The mission did succeed in locating a circulation at flight level (1500 ft) and at the 700-mb level.

The second aircraft reconnaissance mission was able to close off a surface circulation the following morning at 05/0034. Maximum sustained winds observed were 30 kn and the MSLP was 1004 mb. On the basis of this report, the first warning was issued on the system as a tropical depression. The forecast called for continued movement towards the west-northwest with slow intensification.

Initial expectations proved reliable for the first 24 hours in warning status. The system was upgraded to a tropical storm at 0600 on the 5th on the basis of an increase in convective organization apparent from satellite imagery.

Abby started to move on a more north-westward track on the 6th, even though all JTWC forecast aids were indicating west-northwestward movement. This was a problem that persisted for the next 11 days. Intensity forecasting also proved to be difficult. Initial expectations were quite accurate for the first 48 hrs in warning status. As expected, Abby was upgraded to a typhoon at 1800 on the 6th when satellite imagery indicated the presence of a weakness in the central dense overcast. The presence of an eye and the accuracy of the intensity estimate by satellite were confirmed 5 hrs later by reconnaissance aircraft reports of 65 kn winds and MSLP of 973 mb.

On 7 August, Abby began to intensify rapidly, far exceeding initial forecast expectations. Reconnaissance aircraft at 07/1141 reported a MSLP of 946 mb, a decrease of 27 mb in approximately 12 hrs. Other data collected on the aircraft reconnaissance mission indicated that Abby was about to undergo rapid intensification. Abby continued to intensify rapidly over the next 30 hr reaching 120 kn intensity within 12 hrs and maximum intensity of 145 kn at 1800 on the 8th. Abby's lowest central pressure was recorded at 08/2049 when dropsonde data from reconnaissance aircraft indicated a measurement of 888 mb. Figure 10 shows Abby near maximum intensity. Except for minor fluctuations, Abby's intensity decreased slowly and steadily from this point on.

This decrease in intensity was accompanied by a decrease in forward speed as Abby began a slow northward movement for the next two and one-half days.

On the 12th of August, Abby began moving northeastward toward Honshu. Also on the 12th, two other tropical systems developed in the western Pacific; tropical storm Carmen in the south China Sea west of Luzon, and tropical storm Ben to the east of Abby near 26°N, 146°E. The interaction of Abby's outflow with a TUTT cell to the northeast created an area of intense

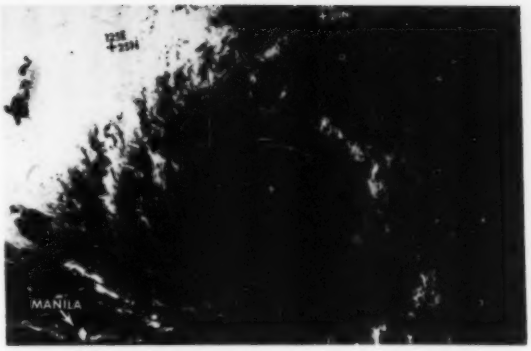


Figure 10.-- An infrared image of super typhoon Abby near maximum intensity at 0946 on the 9th. DMSP IMAGE.

upper-level divergence under which Ben formed. The presence of both of these smaller systems had little effect on Abby, except for drawing some of the inflow away; but in the end, it was Abby which led to the demise of both Ben and Carmen when they became embedded in Abby's massive circulation.

Aircraft reconnaissance data at 14/1035 indicated that Abby's central pressure had risen to 942 mb and that the eyewall was beginning to deteriorate. Abby's intensity fell below 100 kn at 14/1800 for the first time in 7 days. Abby continued moving to northeast on 15 August with a slight increase in forward speed.

Japanese weather radar stations started fixing Abby after 16/0000, with all of the fixes showing continued northeast movement. Data from reconnaissance aircraft, satellite imagery, and synoptic reports indicated that Abby was weakening as it underwent extratropical transition. Abby was downgraded to tropical storm at 17/0000 and soon after made lanfall near Hamamatsu, Japan. After making landfall, Abby moved eastward following the rugged terrain toward Tokyo, weakening rapidly as it interacted with the mountains. At 17/1200, satellite imagery and synoptic data indicated that Abby had completed extratropical transition.

Abby's movement through central Japan caused serious damage over a widespread area. Initial reports indicated that at least two people were killed, 29 others were injured, and one person was missing. The torrential rains generated by Abby resulted in wide-spread flooding, causing numerous landslides and the destruction of 19 bridges. The heavy rains also severly disrupted road,rail, sea and air service in central Japan.

TYPHOON ELLEN

Typhoon Ellen first became apparent on satellite imagery as a tropical disturbance located near 10°N, 170°W on 26 August. The disturbance was located in a data-sparse area, making it difficult to estimate its degree of organization or intensity. Satellite intensity estimates using the Dvorak method indicated maximum sustained winds of 30 kn. These estimates were based primarily on the presence of upper-level banding features.

The disturbance crossed the dateline and entered the JTWC area of responsibility on the 8th. Satellite imagery indicated that the disturbance as intensifying with maximum sustained winds of 35 kn. This prompted the issuance of the first warning on Ellen at 29/0000 which projected continued west-northwestward movement and intensification.

During the next 5 days, Ellen's intensity fluctuated between 25 and 45 kn. Development during this period was inhibited by the lack of low-level westerly inflow and the restriction of upper-level outflow channels to the north by a large upper-level anticyclone centered south of Japan. Ellen weakened to tropical depression intensity briefly on 1 September. After reaching a minimum intensity of 25 kn at 01/1200, Ellen began to strengthen, reaching typhoon intensity 2 days later at 03/1200.

By 1200 on the 5th, Ellen was located 200 mi east of Luzon with maximum sustained winds of 95 kn, Ellen's central pressure dropped 28 mb to 928 mb over the next 12 hr. Ellen reached maximum intensity of 125 kn at 06/0600 (fig.11).

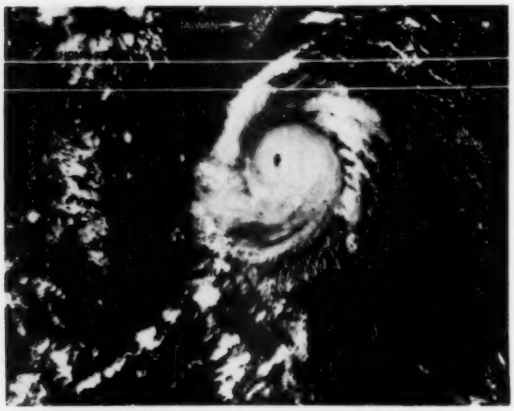


Figure 11.-- Typhoon Ellen at maximum intensity at 0653 on the 6th. NOAA 7 IMAGE.

This peak in intensity was short-lived due to interaction between the southern part of Ellen's circulation and Luzon. Ellen weakened continuously from this point on as it moved through the Luzon Straits and headed for southern China.

Ellen made landfall just south of Macao at 0000 on 9 September. Maximum sustained winds at landfall were 65 kn with gusts to 80 kn. Higher winds due to channelling effects were recorded at the Royal Observatory, Hong Kong, with the highest reported at 90 kn gusting to 140 kn.

Damages in Hong Kong were extensive. Preliminary reports indicated that 6 people were killed and 277 were injured, with 120 requiring hospitalization. More than 1,600 people sought emergency shelter, mostly residents of makeshift hillside dwellings swept away by high winds, flooding and landslides. Damages to shipping were also extensive. The Hong Kong Marine Department reported that 22 ships ran aground during Ellen's passage.

After moving inland, Ellen dissipated rapidly, becoming a 30 kn tropical depression within 12 hr after making andfall.

SUPER TYPHOON FORREST

Forrest was the most intense of all of the tropical cyclones of 1983. After taking a long time to reach tropical storm intensity, it intensified from a tropical storm to a super typhoon in 30 hr and reached a maximum intensity of 150 kn (fig.12).

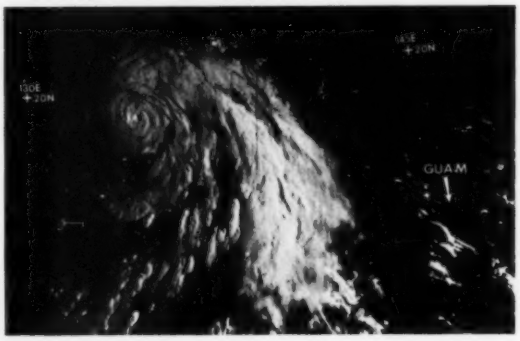


Figure 12.-- Super typhoon Forrest at 150 kn and MSLP of 883 mb at 2223 on the 22d. NOAA 8 IMAGE.

Forrest developed from a tropical disturbance which originated in a broad area of convective actvity located 300 mi to the east of Ponape on 17 September. Four aircraft reconnaissance flights were flown into Forrest during the period 17-20 September. All four were unable to close off a surface circulation. However, the fourth aircraft did succeed in closing off a circulation at the 700 mb level, thereby lending credence to the theory that Forrest originated from a mid-level circulation which developed downward.

The first warning was issued late on the the 20th when satellite imagery indicated the formation of a central dense overcast and good outflow to all quadrants. At this time, Forrest was about 180 mi south of Guam. The forecast called for continued gradual intensification and slow northwestward movement. Reconnaissance aircraft flying a mission on the following morning encountered 50 to 60 kn winds in Forrest's well-defined circulation. Forrest was upgraded to a typhoon at 1800 on the 21st. when satellite imagery indicated a developing eye. Aircraft dropsonde data at 21/2340 indicated that Forrest's central pressure had dropped to 975 mb. About 11 hr later, at 22/1057, a sea-level pressure of 883 mb was recorded. This represented a drop of 92 mb in a little under 24 hr. This is graphically displayed in a plot of Forrest's central sea-level pressure over time (fig. 13) Note the rapid drop in pressure on the 22d.

Fortunately, Forrest's rapid intensification occured after the system had moved well clear of Guam. Even though Forrest as relatively weak when it passed Guam, the island was

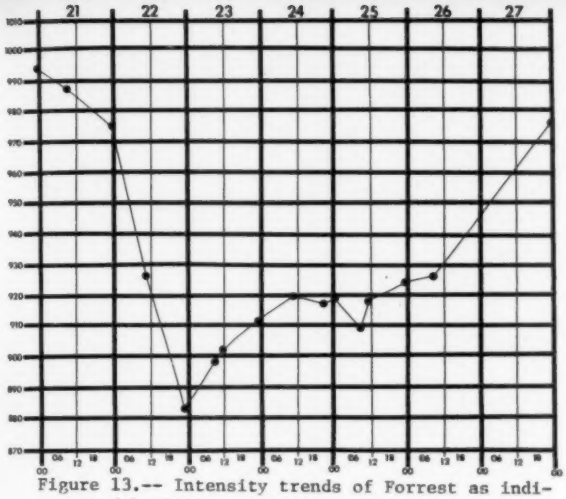


Figure 13.-- Intensity trends of Forrest as indicated by MSLP versus time. JTWC.

subjected to winds gusting in excess of 30 kn and heavy rains. About 2 inches of badly needed rain fell, causing minor flooding but no serious damage.

Prior to recurvature, Forrest passed 107 mi southwest of Okinawa, subjecting the island to high winds and heavy rain. Maximum sustained winds recorded at Kadena Air Base were 50 kn with gusts to 74 kn. Rainfall totalling 11.65 in resulted in flooding which caused minor damage to the installation. Other damages due to high winds were limited to minor personnel injuries and the loss of some antennas. Prelimary reports from Japanese authorities indicated that the ivilian population of Okinawa weathered the storm equally well.

Residents of Inza Island, northwest of Okinawa, were not so fortunate. A tornado, spawned during the passage of Forrest, cleared a swath 300 ft wide across the island, destroying homes and injuring 26 people, some seriously. There were also reports of tornadoes over Okinawa, however, none of these touched down.

While moving past Okinawa, Forrest began to interact with a frontal system moving off the Asian continent. Within 48 hr of the onset of this interaction, satellite imagery indicated that Forrest had lost its deep convection and had begun to take on extratropical characteristics. Shortly thereafter, Forrest recurved to the east-northeast and accelerated rapidly.

Forrest weakened dramatically while undergoing extratropical transition. This was fortunate since its track during this period carried it into heavily populated areas of southern Japan. While crossing the island of Kyushu, Forrest passed approximately 25 mi south of Sasebo where five U.S. Navy ships and several ships of the Japanese Maritime Self Defense Force were in port. This harbor had previously been evaluated as a safe typhoon haven due to the sheltering effects of the topography in the area. This evaluation was proven correct when none of the ships in the harbor suffered damages during the passage of Forrest. Other areas in southern Japan suffered extensively from high winds and heavy rains. Initial reports indicated 21 dead, 86 injured and 17 missing. Heavy rains, up to 19 in in some areas, caused numerous landslides and widespread flooding resulting in damages to 46,000 homes, some of which were total losses. The storm also stranded 28,000 travelers due to the disruption of domestic flights and rail service.

Forrest completed extratropical transition on the 28th at 0600 while located near the southern tip of Shikoku. From this point on, Forrest continued to weaken and move rapidly toward the east-northeast as an extratropical system.

TYPHOON IDA

The origins of Ida can be traced to an inverted trough which was first detected near Saipan using synoptic data on 6 October. Although this is he earliest point at which a reliable track can be established, there appears to be a linkage between the inverted trough and a convective cloud mass which developed approximately one week earlier in the center of a TUTT cell.

The inverted trough rapidly developed and became a closed circulation with 20 kn winds by 1200. Signs of continued development, pressure falls in the area, and increasing winds at nearby stations, led to the first warning on Ida as a tropical depression at 07/1800 when it became evident from satellite imagery that a central convective feature was forming. Upgrade to tropical storm status followed on the subsequent warning after reconnaissance aircraft revealed that maximum sustained winds associated with Ida had risen to 40 kn and MSLP had dropped to 1000 mb.

Ida moved northwestward as expected and intensified, reaching a maximum intensity of 65 kn on the 10th after turning north-northeastward (fig.14). Shortly after reaching maximum intensity, Ida began to interact with a frontal system to the north. This resulted in a weakening and acceleration to the northeast as Ida underwent extratropical transition. Ida's track south of Japan was well documented by timely reports from Japanese radar stations which proved invaluable in positioning the rapidly moving system.

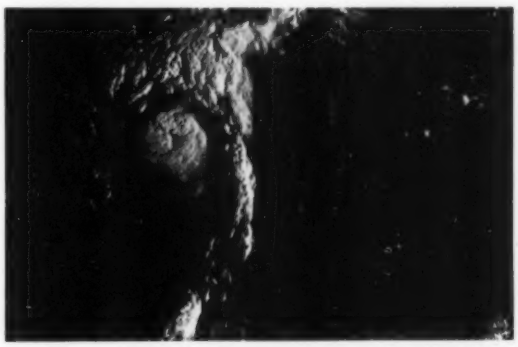


Figure 14.— Ida near maximum intensity and interaction with the frontal system to the north led to extratropical transition. NOAA 8.

TYPHOON JOE

During the month of October, tropical cyclone activity in the western Pacific was concentrated in the South China Sea. Six tropical cyclones formed between 29 September and 26 October in the western Pacific. Five of the six, formed as tropical depressions in the Philippine Sea and crossed the Philippines prior to intensifying in the South China Sea. All five moved westward without recurving. Typhoon Joe (15W) was the most intense of these and the only one of the five to achieve typhoon intensity.

Joe's origins can be traced back to 6 October when it was detected as a tropical disturbance located well to the south of Guam. At 0000 9 October, synoptic data indicated that the MSLP in the disturbance was near 1006 mb and that a closed surface circulation was developing. Winds of up to 25 kn were estimated from satellite analysis as convective cloudiness and organization increased.

An Aircraft investigation of the area, completed at 10/0204, revealed a closed circulation center with a central pressure of 1003 mb and 30 kn winds. The mission ARWO (Aerial Reconnaissance Weather Officer) Reported that he suspected the presence of multiple centers, but was unable to locate any other areas of light and variable winds that would be associated with such centers.

Joe remained poorly organized and as he crossed central Luzon. Synoptic data and radar reports indicated that the system was still poorly organized (fig. 15).

After emerging in the South China Sea, Joe became better organized and intensified as it moved in a wide anticyclonic track around the western periphery of the subtropical ridge. Upper-level flow patterns at this time were favorable for Joe's development and allowed the formation of well-defined outflow channels to the northeast and southwest.

Figure 15.-- Surface analysis for 0000 October 10.

Joe continued to intensify as he moved northwestward reaching a maximum intensity of 65 kn 6hr prior to landfall. Joe dissipated rapidly after moving inland over southern China approximately 100 mi west of Hong Kong.

TYPHOON LEX

The tropical disturbance which became Lex was extremely slow in developing and achieved typhoon intensity for a period of only one day. Yet it was one of the most damaging cyclones of the season, responsible for the loss of a ship in the South China Sea and extensive suffering in central Vietnam where it eventually made landfall.

Lex was monitored as a tropical disturbance for 8 days prior to issuance of the first warning on the system as a tropical depression. It was first detected in the vicinity of the Marshall Islands on 14 October when satellite imagery revealed the presence of an area of active convection near 9°N, 164°E. Synoptic data in the area at this time indicated that there was not a surface circulation associated with the disturbance but did indicate a 24-hr drop of 1 to 2 mb in sea-level pressure at nearby stations.

The JTWC monitored the progress of this disturbance while it was crossing the central Philippines. The topography of the Philippine Islands had little effect on the disturbance and it emerged in the South China Sea with no appreciable decrease in its organization.

Lex began to intensify while moving west-northwestward away from Luzon. The first warning on Lex was issued on 22 October at 0000 when satellite imagery indicated that the cloud bands associated with the system were taking on a comma-shaped appearance. Although Lex was designated as a tropical depression on the initial warning, upgrade to tropical storm status followed quickly when a reconnaissance aircraft encountered 35 kn winds while fixing the system at 22/0535. Lex began moving slowly northward after 22/0600. This slow northward movement culminated in a counter-clockwise loop near 17.5°N, 114.5°E, approximately 300 mi south of Hong Kong. After completing the loop Lex continued westward.

Lex intensified while moving westward, reaching a maximum intensity of 70 kn at 0000 on the 25th. Gradual weakening occurred over the next 24 hr as Lex passed to the south of Hai-Nan island. The interaction of the circulation with the rugged terrain of Hai-Nan had a pronounced effect on the system. The decrease in organization and convection, apparent from satellite imagery, led to the downgrade of Lex to tropical storm status at 25/1800. Lex weakened further while transitting the Gulf of Tonkin, making landfall near Dong Hoi, Vietnam with maximum sustained winds of 50 kn. Lex dissipated rapidly over the rugged terrain of central Vietnam and Laos after causing extensive damage to low-lying areas in its path.

According to reports from Vietnam, areas near the point of landfall were devastated by the high winds and torrential rains associated with Lex. Damage was extensive as rivers rose 6 ft, resulting in widespread flooding. Hundreds of people were killed or injured, 17,000 homes were destroyed, and six hospitals were seriously damaged. In addition, an estimated 100,000 tons of starch food may have been lost due to the flooding.

Other damage caused by Lex came to light after the dissipation of the storm. The oil drilling ship, GLOMAR JAVA SEA, was operating in the vacinity of Hai-Nan island during the passage of Lex. A search was conducted for the ship after

Figure 16.-- A file photo of the GLOMAR JAVA SEA. WIDE WORLD PHOTO.

radio contact was lost during the storm. The 5,926 ton vessel was finally located using sonar under 300 ft of water about 60 mi south of Hai-Nan island. There have been no reports of survivors from the crew of 81 (fig. 16).

SUPER TYPHOON MARGE

The tropical disturbance which developed into the fourth super typhoon of the season was initially detected on 26 October as an area of unorganized convection associated with weak surface circulation near 7°N, 172°E. Synoptic data at the time indicated that surface winds associated with the disturbance were weak, 5-10 kn and MSLP was 1012 mb. This disturbance organized slowly over the next 4 days as it moved westward along the monsoon trough axis. During this period, an upper-level anticyclone formed in close proximity to the low-level circulation. This development was accompanied by a drop in MSLP to 1008 mb and a concurrent increase in the convective activity associated with the circulation. The first warning was issued at 1200 on October 31. At this time Marge was 180 mi south of Guam and moving northwestward. Marge achieved typhoon status at 0600 November 2 and super typhoon intensity of 145 kn on the 4th (fig.17). She recurved toward the northeast on the 5th. She raced off northeastward at speeds up to 54 kn and was extratropical early on November 7. Even though extratropical she still had hurricane-force winds for awhile. The high speed of movement resulted in an asymmetric wind field. The winds in the southeast semicircle were much higher than in the northwest semicircle.

The asymmetric nature of Marge's wind field proved beneficial to the crew of the Colombian Navy Sailing-Ship ARC GLORIA. GLORIA was fortunate enough to encounter the weak northwestern portion of Marge's circulation. Even so, GLORIA reported seas to 30 ft and winds gusting to 90 kn as Marge passed to the southest. The high winds and heavy seas encountered by GLORIA resulted in the injury of three crewmen, the loss of a motor boat and five sails, and minor structural damage.

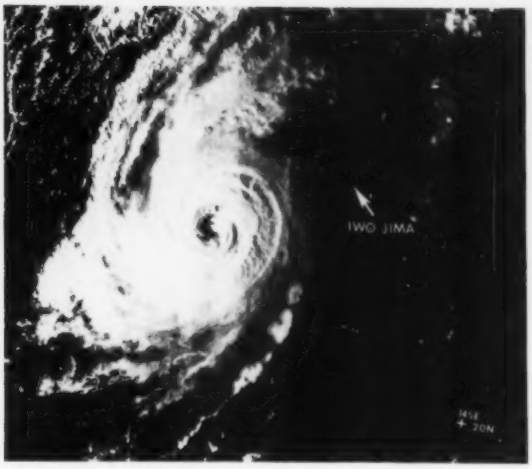


Figure 17.-- Marge at recurvature, 0611 Nov. 6. The winds were 115 kn. NOAA 7.

TYPHOON ORCHID

Typhoon Orchid was the first of three tropical cyclones to develop in the western North Pacific during mid-November. This flurry of activity in the northern hemisphere was accompanied by the development of two tropical cyclones in the southern hemisphere, tropical cyclone 04S and tropical cyclone 05S (Quenton). The establishment of strong low-level westerlies at low latitudes on both sides of the equator preceded the onset of activity.

Orchid developed from a tropical disturbance which was first detected on 12 November as an area of convective activity located 300 mi north of Truk. The disturbance moved southwestward over the next 3 days as its convection increased in intensity and size. The first aircraft reconnaissance mission to investigate the disturbance was conducted on 15 November while the disturbance was located 170 mi southwest of Guam. Later satellite imagery indicated that the disturbance was becoming better organized with an increase in convective activity, accompanied by the development of an upper-level anticyclone. The first warning on Orchid as a tropical storm was issued at 1800 on the 17th when intensity estimation by satellite indicated that maximum sustained winds were in the 40-45 kn range.

Orchid's movement from this point on was highly erratic. Strong low-level northeasterlies were opposed at higher levels by southwesterly flow which resulted in a continual conflict in steering. This complex environment was further complicated by the development of Typhoon Percy in the South China Sea. The separation distance between Orchid and Percy remained constant at 850 mi throughout the period of their coexistence. Although there was not a Fujiwhara interaction observed in this case, the possibility of interaction was under constant consideration by JTWC forecasters.

In spite of the effects of vertical shear experienced by Orchid and Percy, both systems

achieved typhoon intensity. Orchid's maximum intensity of 125 kn was accompanied by an MSLP of 928 mb measured by aircraft on the 23rd. However, both systems eventually succumbed to the effects of vertical shear. Two days after reaching maximum intensity, Orchid had weakened significantly. Although maximum sustained winds were 55 kn, MSLP was up to 995 mb. Winds associated with Orchid were higher than might be expected for a circulation with such a high central pressure because ambient low-level flow was particularly strong. Gale force northeasterlies on the northwest side of Orchid's circulation augmented the winds on that side, resulting in a band of high winds which were much stronger than the winds on the southeast side of the circulation.

As Orchid weakened, the influence of low-level steering became greater and the circulation moved southward. By the time of the final warning, Orchid was located 40 mi west of the position it had occupied 5½ days earlier.

Although Orchid posed a threat to the Philippine Islands for several days, landfall was not made on any of the islands. However, high winds and seas associated with Orchid posed a hazard to maritime interests at great distances from the center. An inter-island ferry, DONA CASSANDRA (487 tons) capsized and sank in the Suriago trait during a transit between Butuan,, Mindanao and Cebu. Of the 387 passengers and crew onboard, 167 were killed.

In addition to the loss of the DONA CASSANDRA, Orchid was responsible for damages to the MALLORY LYKES. The MALLORY LYKES was headed west across the Philippine Sea when she passed close to Orchid's center. The 60 kn winds and 24-ft seas encountered by the ship caused two engines carried as cargo to break free of their lashings. These eight-ton engines caused considerable damage to hull frames and plating as they clattered about but fortunately did not injure any personnel.

TYPHOON PERCY

From genesis to dissipation, every aspect of Percy's life was affected in some manner by its proximity to typhoon Orchid. As Orchid neared the Philippines on 17 November, an area of upper-level divergence was created over the South China Sea where Orchid's outflow split into southerly and easterly components. Beneath this upper-level divergence, the confluence of the northeasterly monsoon and the south-westerly inflow into Orchid created an area of high positive vorticity. Typhoon Percy formed in this fertile environment.

A tropical disturbance quickly formed but showed no signs of further development until 1600 on 18 November. In the 8 hour period between 18/1600 and 19/0000, the disturbance intensified rapidly, forming convective bands and an upper-level anti-cyclone. A reconnaissance aircraft investigated the area shortly after issuance of the first warning and found a well-developed tropical storm with a circular eye and maximum sustained winds of 50 kn.

Percy moved very erratically for the first 4 days in warning status. After completing a series of loops and feints, Percy's position at 0600 on the 23d was only 90 mi from its position at 0600 on the 19th. The proximity of Orchid to the northeast of Percy and the complicated steering environment in which both systems were embedded made forecasting especially difficult. The possibilities were endless; Fujiwhara interactions or the entrainment of one system into the other were two of the scenarios considered at the time by JTWC forecasters.

Percy eventually sheared and became embedded in Orchid's inflow, but not before achieving typhoon status and a maximum intensity of 70 kn. The reports of reconnaissance aircraft throughout Percy's life best tell the story. On 19 November, the first aricraft encountered a well-developed tropical storm with 50 kn winds, and a circular eye. The next mission at 20/0905 encountered a 70 kn typhoon with an MSLP of 971 mb. By 20/2344, Percy was beginning to shear and the aircraft reported a ragged ellipitical eye with a poor radar presentation. The 21/0950 reconnaissance flight reported that Percy no longer had an eye and that all clouds were below the 700-mb flight level. By the time of the 23/0241 mission, Percy was an exposed low-level circulation with maximum sustained winds of 35 kn. The final aircraft reconnaissance mission, at 24/0200, was unable to fix Percy.

Names for western North Pacific tropical cyclones. The names are assigned in rotation, alphabetically. When the last name (Winona) has been used, the sequence will begin again with "Andy".

NAMES FOR TROPICAL CYCLONES

Column 1	Column 2	Column 3	Column 4
ANDY	ABBY	ALEX	AGNES
BESS	BEN	BETTY	BILL
CECIL	CARMEN	CARY	CLARA
DOT	DOM	DINAH	DOYLE
ELLIS	ELLEN	ED	ELSIE
FAYE	FORREST	FREDA	FABIAN
GORDON	GEORGIA	GERALD	GAY
HOPE	HERBERT	HOLLY	HAZEN
IRVING	IDA	IKE	IRMA
JUDY	JOE	JUNE	JEFF
KEN	KIM	KELLY	KIT
LOLA	LEX	LYNN	LEE
MAC	MARGE	MAURY	MAMIE
NANCY	NORRIS	NINA	NELSON
OWEN	ORCHID	OGDEN	ODESSA
PAMELA	PERCY	PHYLLIS	PAT
ROGER	RUTH	ROY	RUBY
SARAH	SPERRY	SUSAN	SKIP
TIP	THELMA	THAD	TESS
VERA	VERNON	VANESSA	VAL
WAYNE	WYNNE	WARREN	WINONA

NORTH INDIAN OCEAN TROPICAL CYCLONES, 1983

Extracted from the Annual Tropical Cyclone Report, 1983, U.S. Naval Oceanographic Command Center, Joint Typhoon Warning Center, Guam, Mariana Islands.

Tropical cyclone activity in the North Indian Ocean was below normal during 1983. Only three storms originated in this area as compared to the annual average of 4.6. A fourth system, Tropical Storm Kim, moved into the area from the western North Pacific. Table 5 provides a summary of North Indian Ocean tropical cyclone activity, and figure 18 their tracks.

Table 5.-- Significant tropical cyclones, 1983

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	ESTIMATED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
1. TC 01A	10 AUGUST	1	3	45	985	461
2. TC 02B	3 OCT - 4 OCT	2	5	50	990	370
3. TC 03B	7 NOV - 9 NOV	3	10	55	980	900
	1983 TOTALS:	6	18			

NORTH INDIAN OCEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ALL TROPICAL CYCLONES	-	-	-	-	-	-	-	1	-	1	1	-	3
1975-1982 AVERAGE	.1	-	-	.1	.8	.5	-	-	.6	1.0	1.4	.4	4.6
CASES	1	-	-	1	6	4	-	-	3	8	11	3	37

FORMATION ALERTS: Two out of three systems on which Formation Alerts were issued developed into significant tropical cyclones.

WARNINGS:
- Number of warning days: 6
- Number of warnings days with two tropical cyclones in region: 0
- Number of warning days with three or more tropical cyclones in region: 0

TROPICAL CYCLONE 01A (Aurora)

Aurora was first detected on 8 August using satellite imagery. It appeared as a loosely organized area of convective activity in the northern Arabian Sea. Synoptic data was sparse in the area and was not useful for intensity estimation. Dvorak intensity estimates indicated that maximum sustained surface winds in the area were approximately 25 kn. This convective area was monitored by satellite for the next 24 hrs and continued to appear loosely organized as it moved westward across the Arabian Sea.

On August 9, the system became better organized and appeared to have formed a coherent surface circulation (fig. 19). Dvorak intensity estimates continued to reflect tropical depression strength and synoptic data at the time gave no indication of the presence of a surface circulation in the area.

The initial warning was issued at 0000 on the 10th after shipboard surface observations indicated the presence of 40 kn northeasterly winds near Aurora. At the time, Aurora was approximately 90 mi east of the coast of Oman with evidence of a strong 35 to 45 kn south-westerly monsoon gale area extending to near its latitude. Aurora moved rapidly onshore during the subsequent 12-hr period and dissipated.

TROPICAL CYCLONE 02B

Tropical cyclone 02B was first detected on 28 September as an area of weakly organized convection located near the southern tip of Burma. Strong upper-level easterly flow over the system

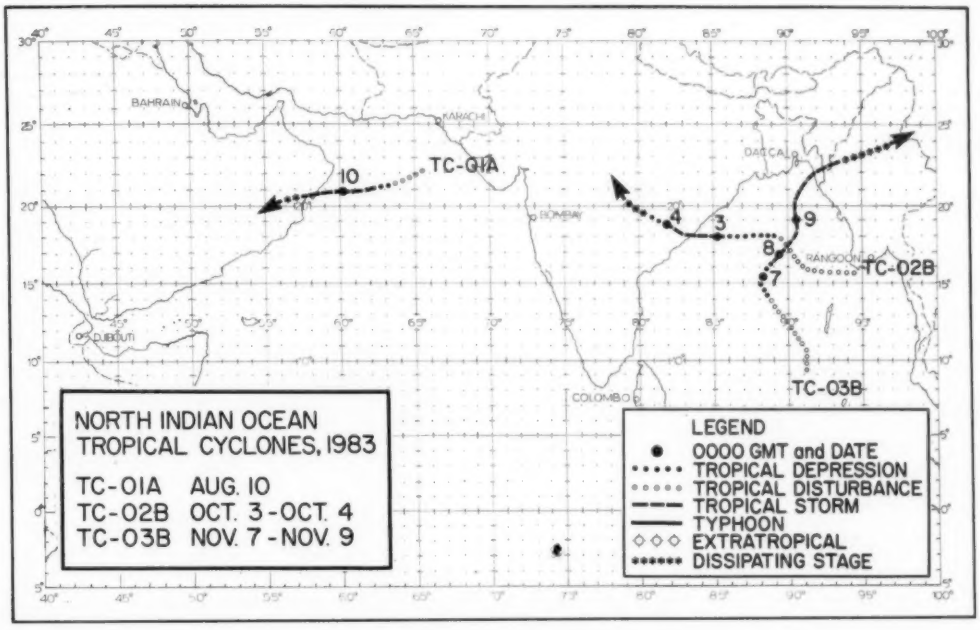


Figure 18.-- North Indian Ocean tropical cyclone tracks, 1983. JTWC.

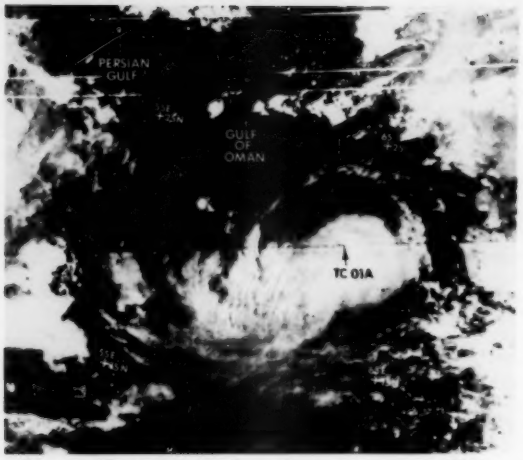


Figure 19.-- Tropical cyclone Aurora at 1057 on August 9. NOAA 7.

inhibited the formation of outflow channels to the northeast; therefore it moved slowly west-northwestward over the next 4 days without increasing in organization or intensity. The system eventually moved away from its unfavorable environment and became a significant tropical cyclone.

As tropical cyclone 02B continued moving west-northwestward across the Bay of Bengal, its upper-level environment became more favorable for development of the system. Outflow channels became established when the upper-level easterly flow abated over the circulation. An Advisory was issued on October 1 in view of the increased potential for further development. The first warning was finally issued at 0000, October 3. The initial warning on tropical cyclone 02B was prompted by satellite imagery which indicated that the system had intensified significantly over the past 24 hrs with estimated winds of 45 kn.

The forecast called for continued west-northwestward movement and slight intensification prior to landfall on the eastern coast of India. Tropical cyclone 02B behaved as expected, making landfall 20 mi northeast of Vishakhapatnam, India at 1700 on 3 October. After making landfall, tropical cyclone 02B moved inland over India and dissipated.

TROPICAL CYCLONE 03B

Tropical cyclone 03B emerged from the monsoon through during early November and had a relatively brief and uneventful life. A poorly organized surface circulation in the southern Bay of Bengal had persisted for several days in the monsoon trough. A weak upper-level anticyclone centered over the northern portion of the Bay placed the low-level circulation in an environment of non-divergent upper-level flow which inhibited further development.

The surface circulation remained poorly organized while moving slowly northward until November 5. At this time, it came into superposition with the upper-level anticyclone which had shifted southward. Over the next 24 hrs, satellite imagery indicated the development of convective banding features which prompted the issuance of an Advisory at 1600 on the 6th.

The circulation continued to intensify while moving north-northwestward. The first warning on tropical cyclone 03B was issued on the 7th when satellite intensity estimates reached 35 kn. The lack of synoptic data in the area prompted JTWC to rely on intensity estimates from satellite imagery throughout the life of the cyclone.

After passing the axis of the subtropical ridge, tropical cyclone 03B assumed a north-northeastward track and continued to intensify. Maximum intensity of 55 kn was reached at 0000 on the 9th. This intensity was maintained until landfall, 12 hrs later, on the coast of Bangladesh between Chittagong and Cox's Bazar. Tropical cyclone 03B continued moving northeastward after landfall and dissipated over northern Burma.

WE OF NOAA ARE MAKING USE OF THIS SMALL AMOUNT OF SPACE TO EXTEND OUR THANKS TO ALL THE SHIPS' OFFICERS WHO ROUTINELY TAKE SHIPBOARD WEATHER OBSERVATIONS. TO US, THESE EXCELLENT OBSERVATIONS ARE PRICELESS. WE CERTAINLY APPRECIATE RECEIVING THEM REGULARLY.

ICE JAM HALTS LAKERS

Reprinted from Shipmates, Vol 6, issue 7, June 1984 with the kind permission of the U.S. Coast Guard.

Story and photos by PACS Jim Perkins and PAC Stan Christman

At 8 a.m., April 30, Capt. Rudy K. PESCHEL, Commander, U.S. Coast Guard Group Detroit, passed the word that Operation COAL SHOVEL was terminated for the 1983-84 winter navigation season. Operation COAL SHOVEL was conducted primarily to keep the commercial shipping lines on the Great Lakes open for the"lakers," loaded with coal, moving between Toledo and Detroit.

Although it had been a relatively mild winter on the Great Lakes, April 1984 will go down in history as the month when the worst ice jam during the last four decades, if not the entire century, occurred on the St. Clair River. For most of April, commercial ships attempting to navigate the 40-mi-long St. Clair River had to be escorted by a squadron of U.S. and Canadian Coast Guard icebreakers.

Nature had dealt a cruel blow to this critical section of the Great Lakes at the beginning of the spring navigation season. Due to the 3 to 8 ft-thick ice blockade from Lake Huron to Lake St. Clair the U.S. Coast Guard closed the St. Clair River to all navigation April 13.

The following marine broadcast advised, "Due to hazardous ice conditions in the St. Clair River, under the authority vested in the Captain of the Port of Detroit by Title 33, U.S. Code 1223, vessels are restricted from entering the St. Clair River. When conditions improve, Sarnia Vessel Traffic Center will advise the masters of vessels of resumption of operation through the St. Clair River."

"Instead of the situation becoming easier for navigation as spring approached, we had to enforce positive control over the St. Clair River," Peschell said. "The cooperation we received from the shipping industry was outstanding. They listened to us and followed our advice."

A BILLION DOLLAR JAM

The Lake Carriers' Association, which represents most of the shipping industry on the Great Lakes, estimated that the ice jam in the river cost the shipping industry approximately one million dollars per day. "It cost ship owners between $6,000 and $9,000 per day just for crew salaries and fringe benefits, while some of the ships have mortgage costs of $30,000 per day," said Glen Nekvasil, Communications Director for the Lake Carriers' Association.

At one point, late in the month, there were 82 ships waiting to enter the St. Clair River. 64 vessels were heading upbound and 18 ships were waiting for downbound clearance from the Canadian Coast Guard's traffic control center located in Sarnia, Ontario. When a ship arrived in lower Lake Huron or western Lake Erie, it got a number and waited to be called for its escort convoy through the ice-choked river. Convoys consisting of five or six ships with two or three icebreakers transmitted the river for days on end.

April 23, the Canadian Coast Guard vessel DES GROSEILLIERS successfully escorted five vessels upbound through the river system. Five of the seven ships heading downbound were being escorted by the U.S. Coast Guard cutters MACKINAW and KATMAI BAY. It was hoped that the movement of downbound vessels would provide a flushing action to get some of the ice moving down the river into Lake St. Clair (figs. 20 to 23).

Unfortunately, mother nature didn't cooperate.

Figure 20.--CGC KATMAI BAY heads down the St. Clair River to assist some of the 86+ commercial vessels caught in the early Spring ice jam which halted shipping traffic for several days. Four of the five Bay class icebreakers stationed on the Great Lakes became involved in this monumental task. U.S. Coast Guard Photo

Figure 21.--The commercial vessel, BALTIC TRADER, trying to move against the river's current and the flow of ice, finds its bow raised out of the water by the opposing forces. The vessel's two anchors are being lowered to keep it from being pushed down the river. A local television cameraman documented the situation for his station's evening news. U.S. Coast Guard Photo

The slush ice quickly filled in MACKINAW's track and slowed the progress of some of the commercial vessels. Vessels with a lower power ratio actually got stuck in the ice while others, unable to manuever, ran aground, making the transit even more hazardous for those coming along behind.

Then, on Easter Sunday, gale force winds added to the hazardous conditions as some of the upbound vessels waiting in western Lake Erie and the Detroit River started to drag their anchors during the height of the storm. As a precautionary action the Coast Guard advised all commercial vessels heading for northern Great Lake ports from the east to remain in eastern lake Erie in order to minimize the danger of collision with other ships due to the congestion in western Lake Erie.

In addition to MACKINAW, homeported in Cheboygan, Mich. and KATMAI BAY, working out of Sault Ste. Marie, Mich., Capt. Gordon D. Hall, Chief of Operations for the Great Lakes district, ordered in extra resources. CGC BRISTOL BAY, from Detroit; CGC BISCAYNE BAY, from St. Ignace, Mich.; and CGC NEAH BAY, from Cleveland, as well as the Canadian Coast Guard icebreakers DES

Figure 22.--CGC MACKINAW, (upper left) and Canada's CCGS DES GROSSEILLERS pass on the St. Clair River as they attempt to assist the many stranded vessels and move the ice toward Lake Erie. The two vessels, the largest icebreakers on the Great Lakes, were needed around the clock for more than two weeks as the United States and Canada worked side by side to clear the costly ice jam. U.S. Coast Guard Photo

Figure 23.--CGC KATMAI BAY (front), and CGC NEAH BAY head into the fight one more time. Even using all available resources, the battle against Mother Nature was no contest. U.S. Coast Guard Photo

GROSEILLIERS, from Quebec City, Quebec and the GRIFFON, from Prescott, Ontario all converged on the scene to assist.

The U.S. Coast Guard's 180-ft, reinforced-hull buoy tenders BRAMBLE, from Port Huron, Mich. and MARIPOSA, from Detroit, helped with the workload until the other icebreakers arrived on scene.

FERRY SERVICE

One of the duties performed by the cutters during the month was to fill in for the local ferry service to Harsens Island, located near the bottom end of the St. Clair River. School children and commuters had to be transported daily between the island and the mainland.

The schedule called for two runs in the morning and two in the afternoon. A good portion of the time, this task was shared by the buoy tenders BRAMBLE and MARIPOSA. Some of the other Coast Guard cutters filled in from time to time.

The residents of Harsens Island were so appreciative of their efforts that they have inquired about "adopting" the Cutter BRAMBLE which is homeported nearby. According to Peter Matthews, spokesman for the Harsens Island Resident

Association, Lt. Cmdr. Brian Hadler, commanding officer of BRAMBLE did an outstanding job. "He and his crew went out of their way to make all the passengers comfortable while on board the ship."

Coast Guard Air Station Detroit was also called upon from time to time to provide overflights of the entire river system. Their up-to-date ice reports aided the skippers of the icebreakers in determining the best procedure for convoying the commercial vessels up the river. Some of the flights were hampered by the extreme weather and low-lying fog that presisted throughout the area.

POLISH BROTHERS REUNITED

One Detroit-area resident had a joyful occassion thanks to the ice jam. Mr. Jerry Zajac, who was 16 yrs old when he left his native Poland in 1942, in the middle of World War II, thought he would never see his 2 yr old brother Walter again. Jerry found out that his brother was aboard the Polish Freighter ZIENIA LUBELSKA and that due to the ice conditions was waiting at a dock on the Rouge River. He tried several times in vain to catch a glimpse of his brother, noe age 43, through binoculars. Jerry's daughter contacted the U.S. Coast Guard Group in Detroit and requested assistance. The Coast Guard informed the local media of the situation and the rest became history. WJBK-TV in Detroit took action that set up the reunion aboard the Polish Ship.

"It was a mircle sent from heaven that my father and uncle were able to meet," said Mrs. Irene Zajac. "Thank God for the U.S. Coast Guard. My father would never have been able to get to see my uncle any other way. They were so shocked and excited that they really didn't know what to talk about during the 20 minutes they were together aboard the ship. They just talked about each other and how exciting it was to see one another again."

"My father said he feels like a celebrity now, since many people saw the story on several local TV stations, as well as numerous newspaper accounts of the reunion," she concluded.

Jerry and Walter Zajac were reunited one more time when the vessel proceeded into Windsor, Ontario during the jockeying of positions awaiting the next convoy through the ice. They spend over 5 hrs together in a local restaurant courtesy of WJBK.

LOCAL OBSERVATIONS

Many of the older local citizens believed that this was the worst the river had been in 75 yrs. Hardly anyone could remember when the ships could not move in the St. Clair River during the month of April. "Of course, there have been times when the river was closed for a day or two, but never this long," said one veteran sitting on the river bank watching the icebreakers at work. After working on the ice clogged river for more than 2 weeks straight, it's a safe bet that both U.S. and Canadian Coast Guard personnel from each of the units involved hope that it will be at least another 75 years before the ice stops commercial shipping on the St. Clair River for the better part of April.

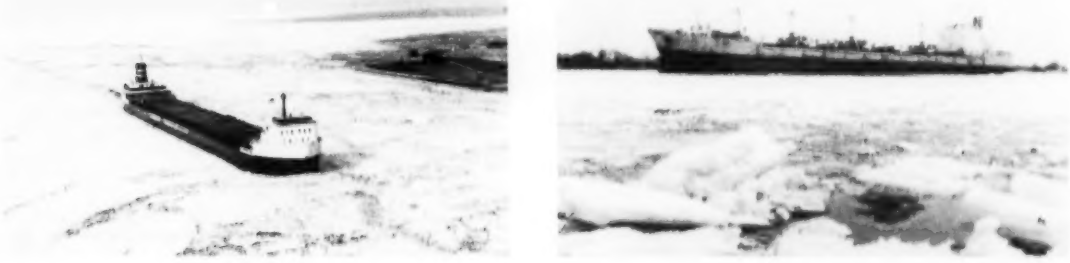


Figure 23a.--The RALPH MISENER (left) enters the St. Clair River from Lake Huron on April 26, and the BANJA LUKA (right) is upbound on the St. Clair River in ice on April 8. Photo by Albert Ballert, Great Lakes Commission.

Marine Observations Program

J.W. Nickerson
National Weather Service
Silver Spring, MD 20910

NEW PORT METEOROLOGICAL OFFICERS

Again, the MOP is back to allocated PMO strength. Over 20 percent of the U.S. commerce passes through the several ports in the New Orleans area, from and to every port in the world. We are glad to have a PMO back in this important port (fig. 24).

The Sault St. Marie PMO position has been moved to Chicago (fig. 25). The outlook on the Lakes, in general, has expanded. There are a lot of ocean vessels, "salties," that only visit a single Great Lakes port, take on a full load and head for Europe, South America, or Asia, without touching any other U.S. port. The Great Lakes PMO's have greatly expanded service to these ocean ships on the Lakes. With the salties wanting barometer checks, some Lakers have said they want to have barometers also and use the full observation form. We will have a problem with equipment temporarily, but there should be no problem in changing the program to what best serves the mariner.

Figure 24.-- Jim Downing, PMO New Orleans.

JIM DOWNING, the newly appointed Port Meteorological Officer of the New Orleans area was born and raised in New Orleans. He has always lived in New Orleans or the suburbs except for 2 yr in San Diego in the U.S. Navy. He received his education and training in weather with the U.S. Air Force through the Louisiana Air National Guard. He entered the U.S. Weather Bureau, now the National Weather Service, in 1955, as an Observer-Pilot Briefer, where he received much additional education and training. He started working at the New Orleans International Airport, then transferred to the Downtown New Orleans Office as a Weather Service Specialist. He spent 16 yr at the airport, then 8 yr at the downtown office, and 5 yr in Slidell as a Weather Service and Radar Specialist. Jim and his wife Helen have been married almost 28 yr and have two sons, two daughters, and a granddaughter. They have been residing in Metairie, Louisiana since 1971.

Figure 25.-- John Orgler, PMO Chicago, IL

JOHN F. ORGLER has been assigned as the Port Meteorological Officer in Chicago, Ill.

He started his meteorological career in the Army as a weather observer assigned to the Dugway Proving Grounds Test Facilities in Utah in June of 1974. His next assignment, in March 1977, was to Chanute Air Force Base in Rantoul, Ill. for training as an Army Weather Forecaster. After 7 mon of school, he was transfered to Fort Greely Alaska for his first assignment as a forecaster. In November of 1978 he returned to Dugway, UT as a forecaster. He ended his military career in July of 1980 as a Buck Sergeant and was hired by the National Weather Service as a forecaster aide at the Forecast Office in Sioux Falls, S.D. In December 1981, he transferred to the Forecast Office in Chicago and worked as a Weather Service Specialist in the Public Service Unit until his new assignment as the PMO in August 1984.

He was born and raised in Chicago and still continues to reside in the city just 2 mi west of Wrigley Field, home of the 1984 Eastern Division champion Chicago Cubs.

50,000th SHIP VISIT

Toni Rippo, our PMO in Los Angeles/Long Beach, CA, passed his 50,000th PMO ship visit last month. Toni has also recruited about one quarter of the vessels in the VOS program. I'm sure everyone in the MOP and the many people he has visited aboard ship join me in congratulating Toni on his truly remarkable feat that is not likely to be duplicated.

SEA AND SWELL PHOTOS

We are approaching the time of year when the seas and swell will be the highest. With your help, I would like to replace the wave chapter of the National Weather Service Observing Handbook No. 1 with color photographs of waves from calm seas to force-12 winds. These pictures will have to come from you who are at sea. They should also be well documented in order to be technically correct. The following are things that are usually asked, most of which are satisfied by an observation sheet.

Ship Name _____
Call_____Date_____Time (UT)_____
Position___Lat.___Long. Course___Speed)ktn)____
Anemometer Wind___Dir.___Spd.___Height _____
(ft/M)_____°C, Air_____°C, Water.
True Wind____Dir.____Spd.(ktn).
Sea Wave_____Period (sec.) _____Hgt.(ft/M).
Swell Wave_____Pers.(Sec)_____Hgt.(ft/M).
Observer/Photographer_____Hgt.(ft/M)
Photo:____Angle on the bow_____Depression angle.
Photographer (print)_____
_____

_____Copy and return photos _____No return required
The photographs that I have forwarded to you are released for publication_____
(signature)

There are many other subjects such as clouds and various weather and ocean conditions that only the mariner would see that we need for illustrations, i.e., extreme storm waves, water spouts, mirages, ice glint, sea ice, the bar of a storm or hurricane, other ships that pass under various weather conditions, ports and various landfalls, to name a few. If you have some good photos in your ditty that you would like to share, I would very much like to see them. Please send as much information as you have about the subject and a statement releasing them for publication. We will give a credit line on each photo unless you request otherwise.

SHIP ROUTING AND THE NATIONAL WEATHER SERVICE

The NWS collects data for all interests and makes it available along with all the computer products to commercial meteorologists and ship routing companies. NWS forecasts are general area forecasts, whereas the commercial meteorologists usually produce more tailored or more in-depth studies or surveillance for a particular area, group, or with a routing service a ship.

It was recently pointed out to me by a ship master that his routing company only wanted the 18Z weather report, while we wanted all 4 synoptic reports. The routing company brochure was misleading. They wanted their customers to send the 18Z message to the company for company business. They, in turn, would relay the weather report back to NWS, which seemed unnecessary, as the routing service companies receive all the observations that NWS receives anyway. The routing companies get their ship observations through direct lines to the NWS. They also get the same computer products that the NWS forecasters get. Any reports they receive independently are normally relayed to NWS. We all work together for your safety.

COMPLACENCY IS A KILLER

How many drivers approaching a street intersection think, "the other guy will stop." Too many. The cemeteries are full of them. The same thing happens at sea. Everyone listens to the weather forecasts, but some think "the other guy will make the weather reports." If he does, he also gets more benefits than those who don't report.

Those that do send in weather reports every 6 hr, or as often as they can, get many more benefits than what the MOP or PMOs can give. When a weather report is received near the synoptic hour, it enters the National Meteorological Center (NMC) computer at Camp Springs, MD (Washington, D.C.). At the same time, the report goes to the high seas and coastal marine forecasters and the U.S. Coast Guard AMVER (Automated Mutual-Assistance Vessel Rescue System) Center at Governors Island, N.Y. The computers at NMC use all the marine obserations that have arrived before the cut-off time to solve complex equations and produce fields of data called "guidance products." These are transmitted to the forecasters where they rejoin the ship weather reports, and information from radars and satellites. All of these are used to produce a forecast which is transmitted to the ships by the U.S. Coast Guard, some commercial stations, and for coastal ships over the NOAA Weather Radio.

If your ship, or the people aboard, should need assistance or medical aid, there are many ships at sea ready to assist you under the coordination of the AMVER program. If you are not now a member of AMVER, ask your PMO to explain it to you on his next visit. It doesn't cost anything and it could be a life saver.

After the immediate rush to get the weather report transmitted, there is the NOAA Form 72-1A "Ship's Weather Observations," which is completed and mailed in once a month to your servicing PMO. He reviews each entry, collects the forms from all the ships he services and forwards the collection to the National Climatic Data Center. There, the forms are photocopied (why we sent you black ink pens) and the data are carefully entered into computers. These data are the base for the NMC computer fields which are the only data if there are no ship weather reports in the immediate area. These data are also used for climatologies, which are vital to engineering and design studies for ships, offshore, and coastal structures.

At a recent conference, I overheard a comment from a nearby group that puts the program in perspective. One master said, "I have a big chunk of the government working for me, our ship sends weather reports." And that is the way it is when you participate.

COASTAL OBSERVATIONS

Hatteras-the graveyard of ships. Over the centuries Cape Hatteras has earned this dubious honor, not because of the Cape itself, but because the warm Gulf Stream and the cooler northerly current meet 20 to 100 mi offshore. When a cold air mass pushes offshore from the Carolina coast over the Gulfstream, there is always the potential for explosive developent as shown in figures 26 to 28.

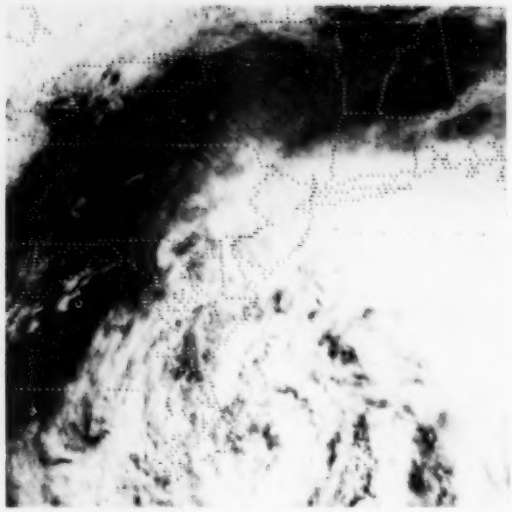


Figure 26.-- The storm as it appeared on satellite at 1300 on June 19, 1982, offshore of Cape Hatteras.

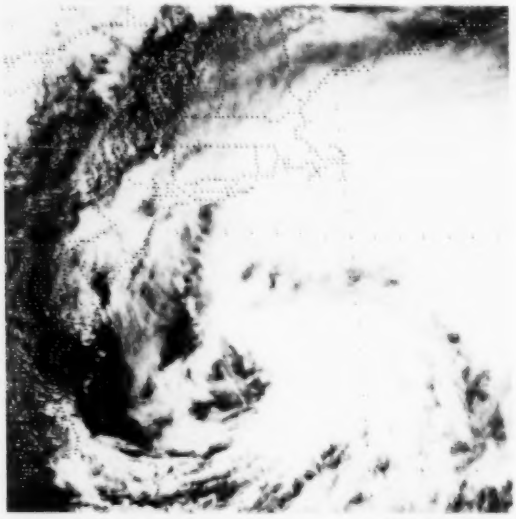


Figure 28.-- The storm as it appeared 6 hr later at 1900.

The satellite image in figure 26 shows a circular circulation of clouds immediately offshore east of Cape Hatteras, but the cloud system actually appears more developed further north, off New Jersey. At the same time, the shore stations along the coast gave no indication of the storm development offshore as shown in figure 27 (from the Spring, 1984 MWL). Only the single ship report gives a true indication of what is happening. Figure 28, only 6 hr later, shows how explosively the system has now developed into a tropical storm. Had the Newport to Bermuda yacht race scheduled for that day not been delayed, that fleet would have been in the middle of the storm.

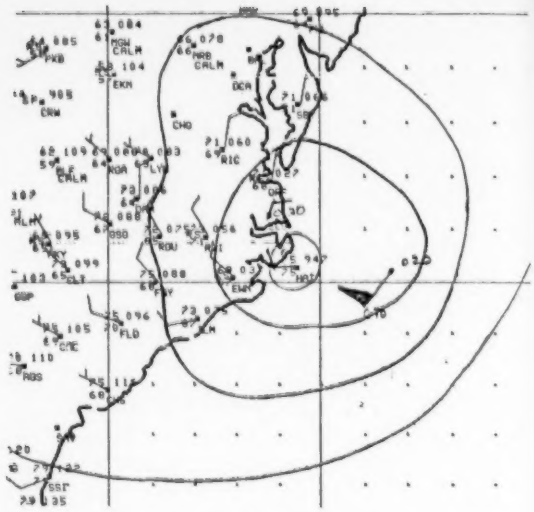


Figure 27.--Excerpt from the 1300 June 19 weather map. The highest coastal station wind is 10 kn, yet the ship 130 mi east of Hatteras has 50 kn winds with gusts to 70 kn.

OBSERVATIONS COUNT

Although the worldwide count of weather observations are down slightly, the weather reports received by U.S. radio stations continue upward. A very well-done to everyone!

	Aug-1984	Jul-1984	Aug-1983
GTS Reports	100,635	102,299	96,618
U.S. Radio/INMARSAT	34,320	34,226	33,728

MAIL BAG

We mailed two black ink pens to each ship for the bridge and another to the radio officer. In reply, I got many suggestions and comments. It is interesting that there are about 3 times as many responses from radio officers than the mates who are making the observations. Maybe they are "letting the other guy do it." I have had several discussions with our communications people, the Coast Guard, and our forecasters about your letters. You may not all get mail answers, but all of your mail has had an impact on the program. Thank you for your interest and participation.

NIGHTTIME OBSERVATIONS

Nighttime weather reports are holding at about one-third the number of daytime ship weather reports. Several radio officers in the HB and HX categories are helping out, and believe me, their efforts are greatly appreciated. The problems are basic:

- Radio officers are not on watch at night
- The weather reports, though made, are not transmitted at night
- Forecasters can't forecast without weather reports.

The morning weather forecast and the morning facsimile map are very important to the master in planning the ship's daily courses and operations--yet, it is the shakiest, because so few

weather reports are available for the nighttime forecast map. We would certainly welcome some comments and suggestions from the mates and radio officers on how to improve this situation. Would a small bonus to the radio officer to get up and get the message off help?

HURRICANE FORECASTS

Any forecast is only an advisory. Hurricane forecasts are no different. The forecasters look at all the data that they can get; satellite images, radar reports, computer products, and land, coastal, island reports and most of all ship reports. Then they have to make a decision about where the storm or hurricane is and where it will move, whether it will intensify or dissipate, whether it will speed up or slow down, etc.

A look at the "Hurricane Alley" feature of this magazine will show many examples of storms that are very changable. Large, powerful storms particularly, hurricanes and typhoons essentially affect the weather in their area so much that they cause a part of their own variability. Some large systems in effect, don't follow the rules - they

Ships must be very cautious about end runs because of both this variable nature of these systems and the broad area of increasing sea and swell ahead of many of these storms. Ships sometimes are unable to maneuver out of a hurricane's track because of these high waves and are engulfed by the approaching storm.

Again, a forecast is an advisory. It is the best the forecaster can bo at the time with what he has. Even one or two additional ship reports might change things. Then there is the timeliness of the forecast. By the time it is received aboard ship it may be old news. You certainly will have more up-to-the-minute information on the storm than the forecaster whether it is a winter storm or a tropical system because you are there. You must adjust the forecast based on the time it was made and what you see for weather conditions at the present time and your present position. Possibly you should send in a SPREP message immediately if the forecast is obviously incorrect. The long communications delay is a major problem for marine forecasters. However, there have been some advances in the last few years and more are pending.

ICING

Almost every year there are fishing and recreational boats lost, usually with all aboard, because of icing. Sometimes ice accumulates so rapidly on the superstructure and the rigging that the crew cannot clear it before the vessel founders and capsizes. Sometimes the accumulation is slow and is ignored until a weather change forces emergency action.

Conditions necessary for topside icing from spray are winds over 20 kn (about where spray becomes noticable); surface water temperature less than 2^{o} celsius, and the air temperature below freezing. Gale and storm conditions with subfreezing air temperatures can be expected to cool the surface water, so water temperatures initially around 5^{o} C should be reason for concern, if the air temperature is low and the wind is high.

"Black Frost" is caused by supercooled fog droplets which form compact, heavy ice. Though rare, it is more dangerous than ice associated with spray, which has a lot of entrapped air. Black Frost is commonly observed with strong winds, fog, low air temperatures and relatively high water temperatures. Arctic sea smoke also occurs under these conditions.

Freezing rain is also rare at sea, but very dangerous if is lasts for a prolonged period. The ice formed is clear, very dense, and heavy.

The best defense is, of course, not being in the area because of a good forecast. However, if you do encounter icing in a small craft there are several things you can do besides the obvious of trying to keep the ship's topside clear of ice.

- Select a heading that minimizes spray if the shelter of a harbor is not immediately available
- Let the Coast Guard know immediately that you are picking up ice, your position, your condition, and your plans (course, etc.).

Icing may disable your radio antenna.

- If you have sea-surface temperature maps from the facsimile recorder or by mail (before you departed) find the nearest warm water eddy where icing would be less likely as another option.
- Ask the Coast Guard to contact the NWS marine forecaster for advice on the extent of the icing conditions and the quickest way out of them.
- You will have to make some weather measurements; wind direction and speed, weather, sea conditions, air and sea temperature, and pass these to the Coast Guard either in plain language or in the synoptic code as a SPREP, if you have the time to encode it.
- If you are in a large vessel not endangered by icing, be sure to send a SPREP as soon as icing starts. It may prevent a marine accident among the smaller vessels.

Tips to the Radio Officer

Julie L. Houston
National Weather Service, NOAA
Silver Spring, MD

CORRECTIONS TO WORLDWIDE MARINE WEATHER BROADCASTS
(January 1984 Edition)

Page 98
0440 Boston, MA NMF
Add: To AREA SECTION, West Central North Atlantic.

Page 100
1040 Boston, MA NMF
Add: To AREA SECTION, West Central North Atlantic.

Page 103
1640 Boston, MA NMF
Add: To AREA SECTION, West Central North Atlantic.

Page 106
2240 Boston, MA NMF
Add: To AREA SECTION, West Central North Atlantic.

Page 138
Add:
Under North Atlantic West, United States of America Station NMF Boston, Massachusetts.

Page 142
Add:
0530
A
New England waters.
3242.5
NMF, Boston, Mass, USA

Add:
0540
P (12)
New England waters.
3242.5
NMF, Boston, Mass, USA

Add:
0550
P (36)
New England waters.
3242.5
MF, Boston, Mass, USA

Add:
0600
P
New England waters.
3242.5
NMF, Boston, Mass, USA

Add:
1730
A
New England waters.
7530
NMF, Boston, Mass, USA

Add:
1740
P (24)
New England waters.
7530
NMF, Boston, Mass,USA

Add:
1750
P (48)
New England waters.
7530
NMF, Boston, Mass, USA

Add:
1800
A
New England Waters.
(Monday - Friday)
7530
NMF, Boston, Mass, USA

Add:
1800
K
New England waters.
(Saturday and Sunday)
NMF, Boston, Mass, USA

Page 159
Change: Honolulu, HI to Pearl Harbor, HI for the following times: 1200, 1214, 1228, 1242, 1256, 1310, 1324, 1338, 1352, 1406, 1420, 1434, 1448, 1502, 1516, 1530, 1544, 1608, 1627, 1644, 1648, 1702, 1716, 1738, 1800, 1814, 1830, 1844, 1858, 1912, 1926.

Delete: NMC San Francisco, CA, USA at the following times: 1702, 1712 and 1722.

1717
A(12)
20S - 30N, east of 160W.
4344.1, 8680.1
12728.1
17149.3
NMC, San Francisco, CA, USA

1727
A(12)
30N -60N, east of 160E.
4344.1, 8680.1
12728.1
17149.3
NMC, San Francisco, CA, USA

1737
20S - 30N, east of 160W
4344.1, 8680.1
12728.1
17149.3
NMC, San Francisco, CA, USA

Page 160
Change: Honolulu, HI to Pearl Harbor, HI for the following times: 1940, 1954, 2019, 2033, 2047, 2101, 2115, 2129, 2143, 2157, 2211, 2234, 2248, 2302, 2324, 2346.

NOAA NATIONAL WEATHER SERVICE
SAN FRANCISCO, CA USCG POINT REYES,
CA (NMC) RADIOFACSIMILE SCHEDULE
15 November 1984

TIME	AREA	CHART
1500Z		
1503		PRIMARY LAYER DEPTH ANALYSIS
1513		EXPERIMENTAL
1523		EXPERIMENTAL
1715Z		
1718	6	12Z TROPICAL ANALYSIS
1728	5	12Z SURFACE ANALYSIS
1738	6	SATELLITE IMAGERY
2000Z		
2003		RADIOFACSIMILE TRANSMISSION SCHEDULE
2013	5	500 MB CONTOUR AND MAX WIND
2023	5	SATELLITE IMAGRY
2330Z		
2333	6	18Z TROPICAL ANALYSIS
2343	5	18Z SURFACE ANALYSIS
2353		EXPERIMENTAL
0100Z		
0103	5	SURFACE FORECAST VALID 00Z
0113	5	SEA FORECAST VALID 00Z
0123		EXPERIMENTAL
0300Z		
0303	3	SEA SURFACE TEMPERATURE ANALYSIS
0313	4	SEA SURFACE TEMPERATURE ANALYSIS
0323	3	SEA AND WEATHER FORECAST VALID 12Z
0333	4	SEA AND WEATHER FORECAST VALID 12Z
0500Z		
0503	5	00Z SURFACE ANALYSIS
0513	5	EXTENDED SURFACE FORECAST
0523		EXPERIMENTAL

AREAS
3 = 40N-52N, EAST OF 135W
4 = 28N-40N, EAST OF 136W
5 = 30N-60N, EAST OF 160E
6 = 20S-30N, EAST OF 160W

FREQUENCIES (KHZ)

ASSIGNED	4346.0	8682.0	12730.0	17151.2
CARRIER	4344.1	8680.1	12728.1	17149.3

PLEASE SEND YOUR COMMENTS TO
THE NATIONAL WEATHER SERVICE AT
660 PRICE AVENUE, , REDWOOD CITY, CA 94063.
VISIT US WHEN IN PORT.

The Editor's Desk

HURRICANE JOSEPHINE STUDIES

Hurricane Josephine was the subject of intense study by AOML/HRD scientists and technicians on October 9, 10, and 11, from the time that the storm was off the north Florida coast until it had reached an area southeast of Cape Hatteras. The two NOAA/OAO P-3 aircraft were used simultaneously for each of six hurricane synoptic-flow missions. Omega dropwindsondes (ODW'S) were released from the aircraft on the periphery of the storm to obtain detailed measurements of the steering currents that governed its path. Researchers will be studying the ODW data at length, with the goal of increasing hurricane track prediction accuracy. In addition, this information had immediate value for forecasters at the National Hurricane Center, for two reasons: (1) it originated from regions where routine observations were unavailable and (2) it was relayed to them before they were scheduled to issue storm track predictions.

On October 11, the planetary boundary-layer (PBL) experiment was conducted during a 7-hr period between scheduled ODW flights. Surface pressure, surface winds, and ocean response were measured concurrently by an array of sensors positioned within the storm. These instruments consisted of a line of NOAA Data Buoy Center buoys, which were deployed ahead of the storm by the Air Force 920th Weather Reconnaissance Squadron; a stepped-frequency microwave radiometer, which was above the NOAA aircraft that overflew the buoys; and airborne expendable current profiler (AXCP's), which measured ocean thermal and current changes. This was the first such use of drifting buoys and the second time that AXCP's were employed in a hurricane. In addition, side-looking airborne radar observations of directional wind property were obtained. Data were relayed through the NOAA Orbiting Satellite System to hurricane forecasters at the NHC within 3 hrs of collection and used in preparation of surface analysis. (S. Rosenthal,

SCIENTISTS TO STUDY GULF AS SOURCE OF ACID RAIN

National Oceanic and Atmospheric Administration (NOAA) scientists this past summer were seeking to learn whether chemicals rising from the Gulf of Mexico and the Caribbean Sea help create acid rain in the United States.

An airborne research team from the Commerce Department agency were to sample air quality in areas between Corpus Christi and Houston, Texas, and from Mobile, Ala., east across the Florida panhandle.

The Gulf Coast is a major region where air masses flow inland and subsequently produce high pollution episodes over the midwestern and eastern United States, mainly in summer. The degree of pollution is greater than computer models indicate it should be, and the difference may be due to movement across the coastal boundary of unaccounted natural ocean and wetland emissions of acid-forming elements. These precursors -- sulfate, sulfur-containing gases, and alkaline materials -- form naturally in the Gulf, its estuaries, and coastal wetlands, and rise into the atmosphere.

Selection of the research areas followed examination of weather conditions in the Gulf over the past 5 yr.

Periods of onshore winds, which can carry the acid rain precursors northward over the continent, are caused during the summer by high pressure areas that become stalled. During the past 5 yr the high pressure areas have been in a position to produce onshore airflow from the south Texas coast to the Florida panhandle.

The research flights will be flown during periods of favorable airflow and will collect air samples beginning 20 to 30 mi off the coast and ending inland as far as possible, depending upon operational capabilities and how long the onshore winds continue.

Samples also will be collected from within offshore cloud formations for studies on how and at what rate the clouds ingest chemical compounds.

The study is part of the National Acid Precipitation Assessment Program, a multi-agency investigation of acid rain, and is being conducted by NOAA's Air Resources Laboratory, part of the Environmental Research Laboratories.

NOAA conducts research and gathers data about the oceans, atmosphere, space and sun, and applies this knowledge to products and services that benefit all Americans. Its services warn of dangerous weather, chart the seas and skies, guide the use and protection of ocean resources, and help future planning by enriching understanding of the complex physical environment of the Earth.

EARLY MAPS OF THE GREAT LAKES

These two early Great Lakes maps were obtained from Lake Log Chips, Institute for Great Lakes Research, Bowling Green State University, Ohio. Figure 29 is dated 1656 and figure 30 is an 1880 facsimile of an 1670 map.

Figure 29.-- Map dated 1656.

BUOYS TO BE DEPLOYED IN HURRICANE PATH

National Oceanic and Atmospheric Administration (NOAA) scientists were preparing to airdrop satellite-reporting buoys in the path of an Atlantic or Gulf of Mexico hurricane to obtain vital information on sea-surface conditions that accompany them.

The buoys provided researchers with sea-surface wind, temperature and pressure measurements, which should improve their understanding of storm surge, Peter Black of NOAA's Hurricane Research Division, said.

Storm surge is the dome of water driven ashore ahead of a hurricane, sometimes reaching 25 ft above

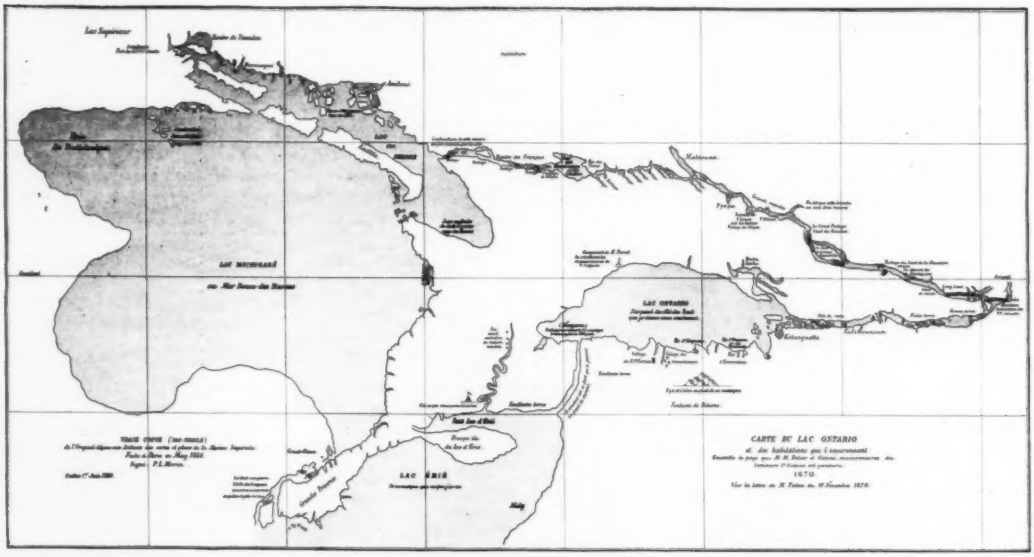


Figure 30.-- Map dated 1670.

normal sea level. It is responsible for most hurricane-related deaths, according to the Commerce Department agency.

Forecasters at NOAA's National Hurricane Center also used data from the dropped buoys with information from satellites, moored buoys, land-based radar, and reconnaissance aircraft flying through and around the storms.

Four 450-pound drifting buoys developed by NOAA's Data Buoy Center in Bay St. Louis, Miss., were to be loaded abroad hurricane reconnaissance aircraft for deployment by the Air Force's 920th Weather Reconnaissance Squadron, based at Keesler Air Force Base in Biloxi, Miss.

The free-floating buoys provided researchers with ocean temperatures down to 600 ft. This helped them determine the available heat stored in the ocean near the storm, and how its energy fuels the storm's intensity and affects its path.

The buoys relayed observations through NOAA's polar-orbiting satellites directly to the National Hurricane Center and the Hurricane Research Division, both in Miami.

Editors note: Three buoys were deployed in hurricane Josephine and very valuable data was received from the buoys according to the Data Buoy Center.

Figure 31.-- Stan Thurston of Foss, Ocean Marine Operations accepted the certificate from Vince Zegowitz National Ocean Services, NOAA.

JUSTINE FOSS RECEIVES AWARD

A certificate of appreciation was awarded to the Foss Launch & Tug tugboat JUSTINE FOSS for its superior participation in the SEAS (Shipboard Environmental Data Acquisition System) program since June 1983. Stan Thurston, Manager for Ocean Marine Operations at Foss, accepted the award from Vince Zegowitz of National Ocean Services, Ocean Services Division (fig. 31).

Operating primarily in the Gulf of Alaska, the crew of the JUSTINE FOSS has been diligent in taking weather observations and entering the coded data into the SEAS unit which is installed onboard. These standard synoptic meteorological messages, as well as water temperatures, are transmitted ashore via the GOES satellite telecommunications system for use in marine weather forecasts and analysis.

The Office Services would like to express its appreciation to those aboard the JUSTINE FOSS and all at Foss Launch & Tug for their cooperation in this project, and is interested in involving other shipping lines and companies in the SEAS program. Those interested in participating in this program by contributing near real-time marine weather observations and other oceanographic data to the National Meteorological Center for use in the creation of products and forecasts for the marine community should contact Vincent Zegowitz at (301) 443-8054.

LETTERS TO THE EDITOR

RIVER EMBLEY AND TROPICAL STORM JUNE

The following letter and data from the remarks pages of the weather log of the RIVER EMBLEY were sent by the 2nd Officer, R.G. Macdonald.

THE AUSTRALIAN NATIONAL LINE

M.V.S.S. RIVER EMBLEY
PORT HONG KONG
4TH SEPTEMBER 1984.

The Editor
Mariners Weather Log
National Oceanographic Data Center
Washington D.C. 20235

Dear Sir,

Please find enclosed photocopy of our Remarks Pages from our Weather Log for Severe Tropical Storm "June" 8412 in South China Sea.

Although our weather encountered was not extraordinary it opened up a Pandora's Box of problems regarding coal-fired vessels operating on long voyage in such areas & as such our Remarks may warrant a space in your "Mariners Weather Log".

Yours Sincerely
R.G. Macdonald.

SEVERE TROPICAL STORM "JUNE" 8412

SOUTH CHINA SEA

27TH - 31ST. AUGUST 1984.

On passage from Gladstone to Hong Kong with cargo of coal thence to Nagasaki for Aramaire Drydocking.
Vessel came under outer influence of Severe Tropical Storm "June" 8412. Although winds were not particularly strong for a S.T.R.S operational necessities limited the options of heavy weather avoidance.
Slow speed steaming & very confused sea & swell conditions were such that course maintenance & avoidance of heavily rolling was difficult [maximum recorded roll 39°] & the vessel had literally to be tacked up the South China Sea as track chart indicates.

	D.T.G	♂ Posn.	HK - FCST	Co	♂ Speed	Pressure	BRG ♂	DIST	ESTIMATED CPA	ESTIMATED BRG	C.P.A DTG	SHIP Posn.	SHIP Co	SHIP SPD	Wind	Barom.
T.D.	28·0430Z	17°55'N	125°20'E	292°	5	994mb	089°	330nm	330nm	089°	30·1032Z					
T.D. *	28·0600Z	17°30'N	124°15'E	270°	8	996mb	037°	351·5	50m	119°	31·0417Z	12°50'N 120°31'E	327°	7	WNW 5	1003·7
TRS	28·0600Z	17°36'N	123°18'E	270°	10	990mb	031°	317·6	50m	309°	29·1650Z	13°04'N 120°29'E	327°	8	W 4	1001·9
TRS	28·2100Z	18°06'N	121°54'E	292°	8	988mb	036°	265·5	10m	310°	30·2300Z	14°52'N 119°18'E	327°	8	WSW 7	998·7
TRS	29·0300Z	18°42'N	120°48'E	292°	10	986mb	029°	221·9	134m	336°	29·1912Z	15°28'N 118°56'E	005°	8	WNW 7	999·1
TRS	29·0600Z	18°46'N	120°00'E	281°	10	985mb	018°	183·9	123m	330		15°53'N 119°01'E	005°	8	WSW 7	998·2
STRS	29·2100Z	19°12'N	117°45'E	292°	10	982mb	323°	130	126m	338	29·1436	17°29'N 119°11'E	325°	7	WNW 8	996·5
STRS	30·0600Z	20°54'N	117°15'E	315°	8	982mb	337°	180·8				18°07'N 118°31'E	316°	7	SW 7	996·6
	30·2100Z	23°24'N	116°12'E	337°	10	986	341°	263·8				17°29'N 119°11'E	355°	10	SW 7	998·2

* UPDATED POSN.

Remarks.

Vessel : Vessel is a modern generation coal-fired bulk carrier. Deadweight 76300 tonnes Length 255 metres. Normal trade is Gladstone to Weipa [Australia] bauxite trade in the relatively enclosed waters of Great Barrier Reef. Normal service speed is about 15·25 kn. @ 78 revs for coal consumption 275 tons/day

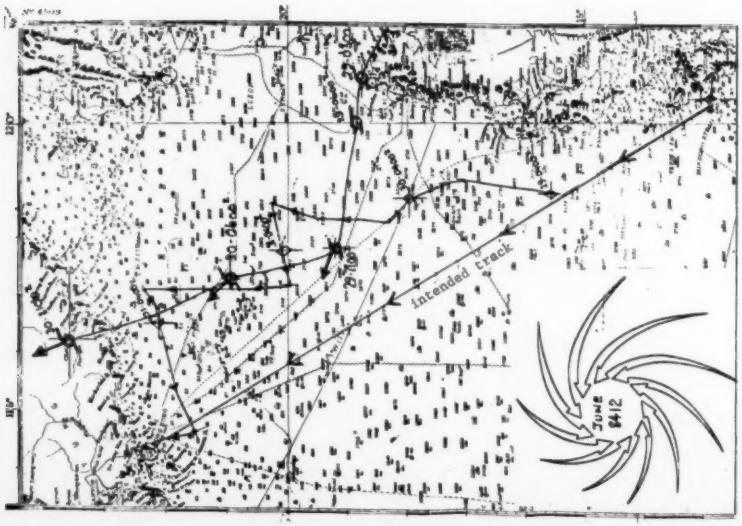
Operational Limitations : For Fuel conservation & ETA purposes vessel proceeded at 52 revs = 10·75 kn. on coal consumption 127 tons/day. Max speed on this voyage's type of bunker coal was estimated to be 60 revs = 12·40 knots.

Vessel entered South China Sea with 839 tons of bunkers remaining thus allowing for 2 days at anchor awaiting berth (consumption 100 tons/day) the vessel had 5 days fair weather steaming capability to cover remaining passage time of 2·75 days

These conditions severely limited storm avoidance options as the vessel could not afford either lengthy detours around the storm or stop [unlike normal fuel vessels this vessel still consumes bunkers when stopped, abt 100 tons/day] & let the storm pass ahead.

A compromise had therefore to be adopted in steerable courses to avoid heavy rolling & subsequent heavy weather damage & still make progress towards destination.

Observers CAPTAIN N.F.G. LIDDLE
M. H. ASTON C/OFF
R.G. MACDONALD 2/OFF
P.C. WARD 3/OFF



MARINE WEATHER REVIEW

The Weather Logs combined with the cyclone tracks, U.S. Ocean Buoy climatological data, gale and wave tables, and mean pressure patterns are a definitive report on the weather systems and primary storms which affected the North Atlantic and North Pacific Oceans during this 3-mo period. Hurricane Alley lists and describes tropical cyclones worldwide. Unless stated otherwise, all winds are sustained winds and not gusts; all times are G.M.T.

North Atlantic Weather Log
April, May and June 1984

WEATHER LOG, APRIL 1984--There were fewer than normal significant low-pressure centers this month. There were several cut-off LOWs east of the Azores. The only concentrated track was from south of Nova Scotia and east of New Jersey to east of Newfoundland and south of Kap Farvel. No significant storm centers penetrated into Europe, most were deflected northward as they approached the continent. One storm formed off Georgia and survived the long trek to the Barents Sea.

There were four low-pressure centers on the monthly mean sea-level pressure chart (fig. 32). The Icelandic Low was 1003 mb near 63°N, 33°W, about 200 mi north of its normal 1008 mb position. A 1006 mb secondary center was near Jan Mayen Island. There was a 1008 mb low center near 42°N, 57°W, and a 1014 mb low center near 38°N, 17°W. The Azores high was 1021 mb near 29°N, 41°W, about 500 mi west of its normal position at the same pressure. There was an anomalous 1022 mb high-pressure center over the east coast of England, and another over northern Quebec.

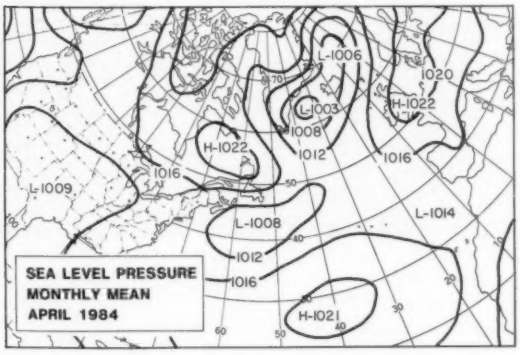


Figure 32.-- Mean sea-level pressure.

The monthly mean anomaly pattern was very cut up. The major negative anomaly centers were minus 7 mb (64°N, 34°W), minus 5 mb (69°N, 10°W), minus 7 mb (36°N, 21°W), and minus 6 mb (40°N, 55°W). The positive anomaly centers were plus 9 mb (53°N, 56°W) and plus 8 mb (58°N, 12°E).

The upper air at 700 mb was quite different from the normal. The primary LOW was 2,757 meters over Baffin Bay, 500 mi south and 17 meters lower than normal. There was an anomalous LOW over Cabot Strait. The flow south of this LOW was zonal from the Great Plains to about longitude 50°W. The usual trough off Europe south of latitude 40°N was sharper than normal. Just to the east there was an anomalous ridge that stretched from Scotland to Gibraltar. There also was an anomalous ridge along longitude 20°E from latitude 80°N south to 60°N.

Some climatology. On April 12, 1934 the wind atop Mount Washington, New Hampshire, 6,280 ft, was 231 mi/hr. The 5 min average was 186 mi/hr. This was the highest wind speed ever clocked in the world.

On April 16, 1851 the famous lighthouse storm raged near Boston harbor. Whole gales and gigantic waves destroyed Minot Light with two keepers inside. There were great shipping losses and coastal erosion.

Extratropical Cyclones--The month started with a storm that paralleled the primary northern shipping lane and was described in the March Weather Log. The Azores High was 1027 mb near its normal location. The last half of the week was marked with multiple weak pressure centers. By the end of the week a strong 1038-mb HIGH moved off Newfoundland and a strong LOW developed west of Cape Finisterre.

The large HIGH developed into an omega block along longitude 50°W with a cut-off LOW west of Gibralter. The LOW replaced the Asores Hogh. By midweek the large HIGH split and the strongest center moved over the United Kingdom. There was now a LOW off Nova Scotia and one over the Norwegian Sea. These remained essentially stationary as high pressure over Europe and the south central ocean blocked their movement.

The cut-off Low disappeared early in the week and the LOWs started to move eastward. The high pressure over Europe was drifting eastward and another north-south elongated HIGH was off the North American coast. The LOWs were generally weak at the end of the week. A large strong HIGH dominated the weather over Europe. Another was centered over the southwest ocean.

The fourth week found a strong LOW over the central ocean moving northward. The last of the week there was a cut-off LOW west of Portugal with a blocking HIGH over midocean. There were LOWs south of Newfoundland and over the Denmark Strait. There were strong Azores and Bermuda

Highs at the end of the month.

This LOW jormed in the col area between two weak high pressure cells east of Cape Hatteras. The new circulation was indicated by very ordiary observations from the NEDLLOYD ROUEN, SEALAND VOYAGER, and CETRA CASSIOPEA. This shows that all observations are needed and helpful. At 1200 on April 5 the storm was 1006 mb near 40°N, 39°W. The FARNES (40°N, 40°W) had 46-kn winds and 21-ft waves. The storm turned northward on the 6th. At 1200 it was 993-mb near 48°N, 30°W. The DOLLY TURMAN (41°N, 41°W) had 45-kn northwest winds, and the TFL ENTERPRISE (40°N, 32°W) measured 52-kn northwest winds and 20-ft waves. At 1800 the TFL DEMOCRACY (44°N, 33°W) found 55-kn winds and 30-ft seas and swells. By 1200 on the 7th the storm had disappeared.

On the 10th the storm turned northward again. There were several reports of winds of 45- to 50-kn. The storm was weakening on the 11th and remained quasistationary until dissipating on the 12th.

This storm came out of the western state of Nevada. At 1200 on the 5th it was over northern Virginia. The TFL FREEDOM was east of Norfolk with 47-kn southeast winds and 23-ft seas. Blue Hill Observatory, Mass. measued 52-mi/hr winds with a maximum gust of 73 mi hr. At this time it came up against a 1037 mb HIGH off Nova Scotia and turned northward. The LOW was 990 mb at 1200 on the 6th (fig. 33). The GYPSUM KING (41°N, 71°W) has 48-kn winds, the HOEGH TRIGGER (41°N, 66°W) measured 50-kn southeast winds. Neither reported waves. The TFL INDEPENDENCE nearby measured 52-kn winds and 26-ft waves. On the 7th the storm abruptly made an anomalous turn to the southeast. The RIGG at 44°N, 50°W measured 54-kn southeast winds and 17-ft seas. On the 8th there were three low-pressure centers within a broad flat cyclonic circulation. By 1200 on the 9th the cyclone had consolidated into one 994-mb LOW. The CETRA CASSIOPEA (38°N, 62°W) found 59-kn north winds. The NEW ZEALAND ALLIANCE (43°N, 61°W) measured 47-kn north winds and 18-ft waves.

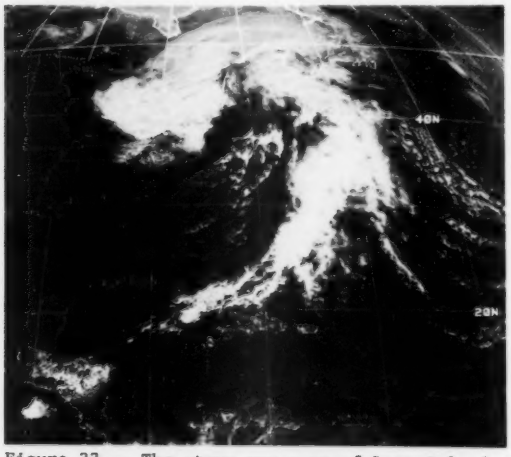


Figure 33.-- The storm was east of Long Island at 1700 on the 6th. SMS/GOES.

The area of gyclogensis east of Kap Farvel produced this storm on the 8th. By 1200 on the 9th it was 980 mb over the Denmark Strait. The MEERKATZE (58°N, 42°W) measured 46-kn west winds and 13-ft seas. Icelandic fishing boats were reporting winds near 45 kn. The storm was 978 mb over Iceland on the 10th. The SEAGAIR had 44-kn south winds near 62°N, 01°E. The KUNUNGUAK (60°N, 20°W) had 41-kn west winds and 30-ft seas. The storm was 974 mb on the 11th. The NORTHWIND was near 59°N, 32°W with 47-kn southwest winds. The storm disappeared on the 14th over Nordkopp.

The Gulf Stream off Cape Hatteras produced this storm early on the 20th. The observatory atop Mt. Washington N.H.(6,280 ft) measured winds of 146 mi/hr from the north. At 1200 on the 22d the circulation encompassed two LOWs, a 986 mb near 40°N, 59°W, and a 980 mb near 47°N, 48°W (fig. 34). The ALBATROSS IV (43°N, 67°W) measured 45 kn north winds and 15 ft seas. The LUDWIGSHAVEN EXPRESS (39°N, 66°W) found 55-kn northwest winds and 20-ft waves. On the 23d the northeastern center dissipated. At 1200 the lone LOW was 972 mb near 44°N, 43°W. The SOKOTO (40°N,55°W) had 57-kn north winds and 25-ft seas. A ship near 37°N, 54°W had 23-ft waves. On the 24th the ANITA SMITS (43°N, 44°W) had 50-kn winds. The EXPORT CHAMPION (38°N, 40°W) had 45-kn winds and 17-ft waves. The KOWLOON PEAK (48°N, 38°W) had 50-kn winds and 26-ft swells. CHARLIE had 20 ft seas on the 25th. At 1200 the storm was 966 mb near 55°N, 40°W. The storm was weakening and dissipated on the 28th.

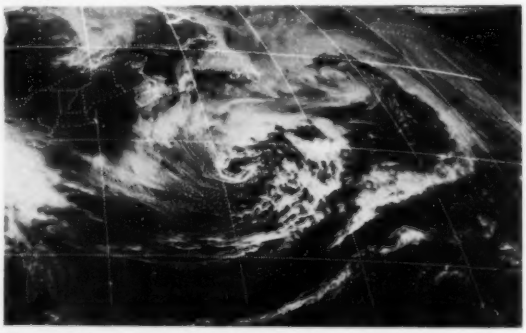


Figure 34.-- By 1700 the northern LOW had moved eastward and the LOW to the southwest had drifted southeastward. SMS/GOES.

This frontal wave formed over the coast of New Jersey on the 23d. At 1200 on the 25th center of the storm was 993 mb near Portsmouth, NH. The RGG at 44°N, 58°W had 52-kn east winds. The WGZL (46°N, 51°W) had 42-kn east winds and 16-ft seas. On the 27th the SEDCO 706 had 40-kn east winds. A Canadian ship south of Cape Race had 40-kn northeast winds on the 28th.

One of the worst ice jams in many years occurred in the St.Clair River connecting Lake Huron to Lake St. Clair and to Lake Erie by the Detroit River during April, 1984. During most of the month cargo ships had to be escorted by ice-

breakers and the river was closed several times.

The usual prevailing westerly winds that tend to blow the ice eastward in Lake Huron were replaced by prevailing winds from the northeast blowing the ice into the St.Clair River. The brash ice clogged the 39-mi river and ice jams of 9-ft or more developed in the lower delta leading into Lake St. Clair. This drastically reduced the river flow and the level of Lake St. Clair was reduced by more than 2.5 ft (figs. 35 and 36).

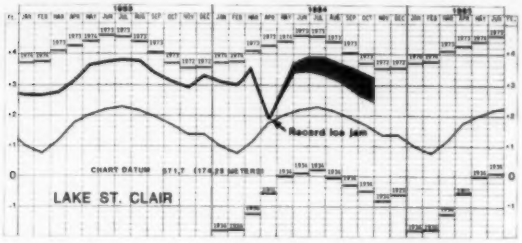


Figure 35.-- Lake St. Clair lake levels from the Monthly Bulletin of Lake Levels for the Great Lakes, April 1984.

Figure 36.-- The USCGC MACKINAW entering the St. Clair River from Lake Huron on April 26. U.S. Coast Guard Photo.

Monster of the Month--The storm factory over north Texas and Oklahoma produced this potential storm on the 29th. It moved rapidly northeastward as it deepened. At 1200 on the 30th it was 980 mb near Green Bay, Wisconsin (fig.37). There was heavy rain ahead of the storm and heavy snow behind it. Winds gusted up to 75 mi/hr. Winds at Chicago gusted to 70 mi/hr and popped glass from high-rise windows and broke trees. Twenty people were injured. At least 12 people were killed by the storm. In michigan over 200,000 customers were without power and up to 12 in of snow fell on the western upper peninsula.

The SENTINEL on Lake Huron measured 50-kn (58 mi/hr) southwest winds, the AGNES FOSS, also had 50-kn west winds and the H. LEE WHITE measured 45-kn west winds and 15-ft waves on Lake Michigan. On May 1 the winds were down to 40 kn. Buffalo measured 47 mi/hr winds from the southwest. The storm was traveling north-northeastward and at 1200 on May 1 was 982 mb over

Figure 37.-- This 1700 image shows the storm centered over the Lakes. SMS/GOES.

James Bay. The storm dissipated over Hudson Bay on May 4.

Between 4 and 5 p.m. on April 30 the high westerly winds produced a 9-ft storm surge on Lake Erie between Toledo and Buffalo. The fishing vessel STANLEY CLIPPER sank on Lake Erie.

On April 23 there were 82 vessels waiting to enter the river, 64 upbound and 18 downbound. Seven icebreakers were trying to clear a passage. Two or three icebreakers would convoy five to six ships. Also on the 22nd gale-force winds caused some of the ships in Lake Erie and the Detroit River to drag their anchors. The GEORGE A. STINSON grounded and the HAN PACIFIC suffered possible damage. By the end of the month the ice jam had cleared and traffic was about normal. See article on page

Casualties Three collisions in fog caused six casualties. The LINDHOLM and TORE HUND collided on the North Sea. The British frigate PLYMOUTH and the West German frigate BRAUNSCHWEIG collided off Bornholm during military operations. The ANNA and ROSELLE collided in the Keil Canal.

The LA LIBERTE had hull damage from an ice jam in the Welland Canal on April 8. The ZETAGAS had ice damage to the rudder on the 4th.

A Polish fishing vessel sank in the Baltic Sea on the 26th. One crewmen survived. The yacht MARACAIBO was crippled by squalls near Bermuda. One of the two crewmen said "A 40-ft wave struck the yacht." It rolled it over, sweeping one man overboard, snapped the mast and knocked out the radio. Fourteen hours later they were rescued by the REED VOYAGEUR. The fishing vessel MAHANOVA 1 sank off Grand Canary Island on the 3d when hit by a strong wave while the 16 crew members were asleep. Three were killed and four were missing.

The following ships reported weather damage: ALMERIA STAR, PENALABRA, RIO CUYAMEL, TRITON No. 1, VIOLETTA, AND WAGON TRAIN.

WEATHER LOG, MAY 1984--There were fewer than normal significant cyclones this month over the ocean. Several storms approached Europe from the northwest. One storm crossed the Mediterranean Sea from Algeria and moved into the Balkans. Since there were so few storms there was not a primary track.

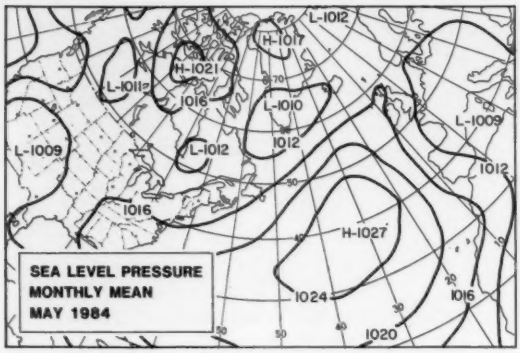


Figure 38.-- Mean sea-level pressure.

There were some major differences from normal in the mean sea-level pressure (fig.38). The icelandic Low at 1010 mb was 1 mb higher than normal but was on the southeast Greenland coast near 63°N, 42°W. This was about 300 mi northwest of its normal location. The Azores High at 1027 mb was 5 mb higher than normal and at 40°N, 31°W. This was about 600 mi northeast of its normal position. It was truly an Azores High. The ridge that normally stretches into Biscay Bay was along the west coast of Ireland. The ridge that stretches into the southeast United States was near normal. There were two anomalous LOWs over Europe, a 1009 mb over the south coast of France and another over Prague. There was also an anomalous 1012 mb LOW east of James Bay.

The primary anomaly center that affected the weather over the shipping lanes was plus 8 mb near 48°N, 30°W. Positive anomaly values covered most of ocean. The zero isoline in the south was along latitude 20°N on the east and 15°N on the west. In the north ocean it was from Belle Isle, Labrador to 64°N, 0° than south across the Irish Sea along longitude 13°Wto the African Coast. There was a minus 7 mb center over central Europe and a minus 3 mb near the tip of James Bay. A tongue of negative anomaly values up to 6 mb covered eastern Greenland.

In the upper air at 700 mb the center of cyclonic circulation was near Thule, Greenland. A trough came out of the LOW through Davis Strait, Angava Bay, tip of James Bay, then south west of the Appalachian mountains. There was an anomalous ridge from 30°N, 40°W to northern Ireland. There also was an anomalous LOW over Belgium. This produced a trough southwestward over Spain and along the coast of Morocco. An anomalous HIGH north of the Caspian Sea produced another ridge over Russia.

Some Climotology-- on May 4, 1812 a storm produced snow from Philadelphia to Maine. A foot of snow fell in New Hampshire and 9 inches fell near Boston. On May 12, 1894 a violent storm hit Lake Michigan wrecking 9 ships.

Extratropical Cyclones--High pressure was the dominate weather influence over the North Atlantic this month. The first week high pressure dominated the weather south of latitude 40°N. Several weak LOWs moved off the eastern United States and Canada to the north central ocean. One storm turned southeastward off Ireland and into the Bay of Biscay. The end of the week high pressure over Greenland built south over Iceland, A large LOW moved eastward over Newfoundland.

The second week high pressure persisted over the United Kingdom. The earlier LOW broke up against the high pressure. A large LOW was over the Mediterranean. At midweek a HIGH was over the central ocean (45°N, 30°W),and a cutoff LOW was southwest of the Azores. The end of the week found a 1034 mb HIGH across the United Kingdom, Scandinavia, and into the U.S.S.R. The few LOWs were weak.

The third week found the Northern Europe HIGH weakening and moving eastward. A 1036 mb HIGH had developed near 45°N, 35°W. There were weak cyclones around the northern perimeter. The HIGH persisted through the week, The end of the week found a large LOW centered over Germany.

The central ocean HIGH drifted slightly south and weakened. LOWs surrounded the HIGH from the northwest quadrant to the east quadrant through the north. The end of the week the HIGH was still 1035 mb near 40°N, 30°W. A large LOW was near Kap Farvel. The end of the month high pressure from Canada reinforced the HIGH over the central ocean and the center moved westward. A severe LOW developed south of Iceland.

This storm came off the eastern slopes of the Rocky Mountains on the 2d. Its southerly circulation was felt off the U.S. East Coast on the 4th. The OMI CHAMPION (35°N, 72°W) had 55-kn south winds at 1200 with 23-ft swells. At 1200 on the 5th the storm was 991 mb over the Bay of Fundy. The RIGG at 44°N, 60°W reported 44-kn winds from 200°. The KMHF (44°N, 58°W) had 40-kn winds. At 1800 the SACHEM (41°N, 63°W) had westerly 50-kn winds and 33-ft swells. On the 6th the EXPORT FREEDOM had 45-kn west winds and 20-ft seas. At 1200 on the 7th the storm was 992 mb near 50°N, 49°W. The FRITHJOF (59°N, 44°W) just off Kap Farvel had northeasterly 45-kn winds. On the 8th at 0000 her winds were 47 kn with 20-ft seas. At 0900 they were reported as 65-kn with 23-ft seas. Kap Farvel reported 50-kn at 1200. The storm broke up late on the 9th.

Canada exported this potential storm on the 6th. It formed west of Winnipeg. It traveled southeastward, then east, then northeastward and was centered over Lake Superior at 1002 mb at 0300 on the 8th. At 1200 the BENSON FORD had 42-kn west winds on eastern Lake Superior. The seas were 13 ft. The southerly winds in the southeast quadrant were off the East Coast. Wallop Island had 52-mi/hr west winds. At 0000 on the 9th a SHIP at 36°N, 74°W had 42-kn southwest winds. The NEW ZEALAND ALLIANCE (43°N, 61°W) had 53-kn southeast winds at 1200. The RIGG at 44°N, 58°W measured 48-kn southeast winds (fig. 39). The storm was still over land east of James Bay, at 1200 of the 10th. It was 989 mb. On the 11th the SEDCO 706 (46°N, 48°W) had southerly 43-kn winds. Late on the 11th the storm died off Goose Bay.

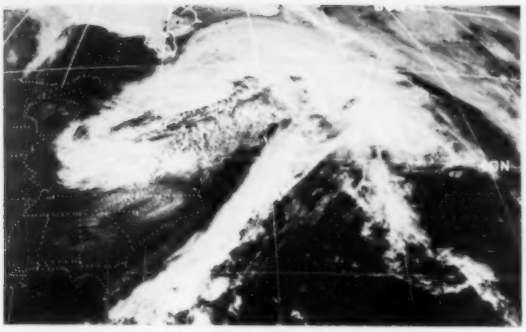


Figure 39.--The storm was moving northward with mainly southerly winds over the water. SMS/GOES.

An area of weak pressure gradient off Cape Hatteras on the 17th produced this LOW. A large 1036 mb HIGH was centered near 42°N, 36°W. The RIGG near 47°N, 48°W were reporting southerly gales. The SAINT LOUIS (35°N, 73°W) had 38-kn northwest winds and 13-ft waves. The NEW ZEALAND ALLIANCE (43°N, 61°W) found 36-kn northeast winds on the 18th. At 1200 the storm was 994 mb at 40°N, 63°W (fig. 40). A ship with the call sign DANO (39°N, 53°W) had only 37-kn southeast winds but the swells were 25 ft. The ALIDA SMITS (39°N, 63°W) reported 54-kn northwest winds. Gales continued on the 19. At 1200 on the 20th the storm was 999 mb near Cartwright, Labrador. The higher winds were east of the front, SEDCO 706 measured 45-kn southeast winds.

Early on the 21st the weak storm crossed the southern tip of Greenland. The storm increased in strength again as it moved toward the Denmark Strait on the 22d where it stalled and remained stationary until it dissipated on the 24th.

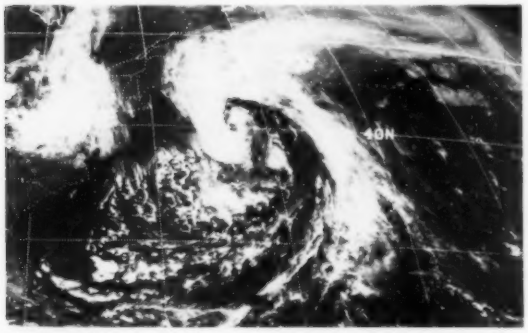


Figure 40.-- The storm had moved very little in 5 hr. SMS/GOES.

This cyclone popped up suddenly in the trough of a cyclone that was off the southeast coast of Greenland, on the 1200 chart of the 30th. The storm was 986 mb near 52°N, 27°W. At 0900 CHARLIE had reported 37-kn northwest winds. Quite a few ships were reporting gales at 1200. The FEDERAL THAMES (50°N, 33°W) measured 40-kn northwest winds with 23-ft waves. The MINERAL ANTWERPEN (48°N, 23°W) measured 50-kn west-southwest winds and 17-ft waves. The AMCO VOYAGER (47°N, 27°W) estimated 42-kn northwest winds and 23-ft waves.

On the 31st CHARLIE measured 41-kn winds and 23-ft waves. LIMA had 45-kn winds and 20-ft waves. The FEDERAL THAMES (51°N, 34°W) now measured 32-kn winds, 15-ft seas, and 30-ft swells. The storm was moving northwestward. On the 0000 June 1 chart another center had formed south of this one. There were now only a few gales associated with the circulation. The original LOW disappeared on June 2 and the other center broke up into multiple weak centers.

Casualties--Fog resulted in two collisions. The HOMING No. 3 and CORONA AUSTRALE collided in dense fog in Cabot Strait. The AYGAZ 3 and the Turkish destroyer TINAZTEPE collided in fog at the entrance to the Bay of Izmit. Three officers and one soldier on the warship were killed, and seven crew members injured.

The MARINA L was damaged when the floating dry dock LONESTAR broke its moorings during a storm at Galveston. The PACIFIC PRINCESS contacted the VALVANUZ during high winds at Valencia. The WILKE was stranded by rough seas 30 mi off Leghorn. The SIBI encountered heavy weather on the 23d with damage to a derrick. The new hull CASTILLO DE LA LUZ broke tow in heavy weather May 1 while 75 mi south of Vigo. The tug POINT VALIANT had steering gear damage off Nova Scotia on the 7th. The CAST OTTER lost nine containers overboard on May 1, 500 mi west of Brest.

Other Casualties--The tug SHAMAL lost tow of the derelict tanker SOUTHWAY off Mossel Bay on the 16th. The SOUTHWAY was lost for 4 days. A dry-dock gate broke the towline in heavy weather off Cape Town and grounded. Several vessels were damaged as the result of 75-kn winds around Buenos Aires and Montevideo. The BUDI, PUENTEMAR 1, and AEGIS FAME were grounded as was the ferry ATLANTIC.

WEATHER LOG, JUNE 1984--There were more than the normal number of cyclones over the ocean this month. More occurred during the last 2 weeks than the first 2 weeks of the month. There was a primary west to east storm path north of the Great Lakes and most of these occurred in the first 2 weeks of the month. The cyclone tracks over the salt water were spread over an approximately 10° wide southwest to northeast band. The center of the band would stretch from about Cape Sable, Nova Scotia to Keflavik, Iceland. The tracks were fairly evenly spaced over the 10° band. These tracks closely matched the climatological tracks. Few storms disturbed Europe. Two entered Scandanavia, one France, and one over the eastern Mediterranean. Most of the cyclones were weak.

The basic overall sea-level pressure pattern did not differ radically from the climatic pattern. In general over the water the pressures were above normal (fig 41). The major feature was the 1028 mb Azores High near 37°N, 31°W. This was 4 mb higher and 300 mi northeast of the climatic Azores High. The Icelandic Low was 1011 mb near 56°N, 49°W, 2 mb higher and about 300 mi southwest of the climatic Icelandic Low. There is another 1009-mb climatic LOW near Cape Chidley. This months LOW was about midway between and 4° latitude south of the two climatic

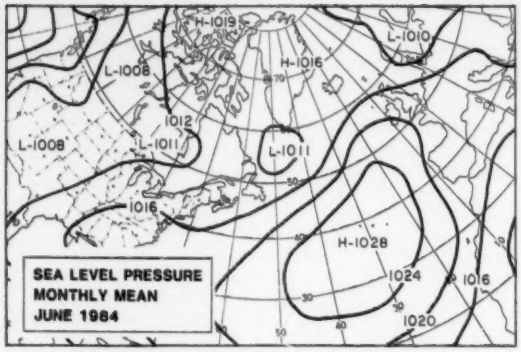


Figure 41.-- Mean sea-level pressure.

LOWs. There was an anomalous 1018-mb HIGH south of Sicily. There was an anomalous 1011 mb LOW over the tip of James Bay.

The primary anomaly center was plus 7 mb near 50°N, 20°W. Although the pressure departure over the North Atlantic was primarily positive the higher departures were around this center in the northeast quadrant. There was a plus 3 mb center east of Resolution Island. There was a minus 4 mb anomaly center over the southern Baltic Sea.

The monthly mean 700 mb height analysis showed a trough from Kap Farvel through Nova Scotia and off the U.S. East Coast. There was a ridge north of latitude 50°N along longitude 15°W. South of 50°N there was a trough off Portugal and Morocco. The HIGH was higher and further north and east than normal. The normal LOW over Northern Baffin Island was higher than normal with an anomalous LOW over Kap Farvel.

Some Climatology--On June 18, 1875 a severe coastal storm or possible hurricane struck the East Coast from Cape Cod to Nova Scotia. On the 22d in 1972 hurricane Agnes deluged Pennsylvania and New York with torrential rains. The most costly flood in U.S. history. On the 19th in 1835 a tornado tore through New Brunswick, N.J. This was the first opportunity for scientists to study the track of such a storm. Meteorologists William Redford and James Espy observed the tornado in progress.

Extratropical Cyclones--The month started with a large 1036 mb HIGH over the midocean. A large LOW, for this time of year, developed over the northeast coast of the United States and there was a multicentered cyclone northeast of the HIGH over northwestern Europe. The HIGH drifted eastward during the week. The western LOW moved northeastward and dissipated over the Labrador Sea. The LOWs northeast of the HIGH consolidated and moved eastward. Another HIGH moved eastward off the U.S. East Coast.

The second week the Azores High weakened and moved northeastward. A large boomerang shaped HIGH stretched from Florida to the Azores to Ireland. A LOW pushed eastward over Cabot Strait but high pressure to the east defeated it.

High pressure still dominated across the subtropical latitudes and up to latitude 65°N over northeastern waters the third week. LOWs and frontal waves moved eastward out of the U.S. Northeast and Canada, but weakened and died as they pushed northeastward against the high pressure west of Europe. The end of the week high pressure from the U.S. East Coast reinforced the Azores High and there was a large 1036 mb center near 44°N, 35°W.

During the fourth week the HIGH drifted eastward and frontal waves moved around and over the top of the HIGH. At midweek another HIGH moved eastward from the Maritime Provinces and at the end of the week reinforced the eastern HIGH. There was a large block from Iceland to 30°N, 40°W. At the end of the month there were high pressure centers west of Ireland and near 35°N, 50°W.

MONSTER OF THE MONTH--This frontal wave formed off the Carolina Coast on May 31. On June 1 it was an elongated north-south double wave off the U.S. East Coast. There was a large 1035 mb HIGH near 36°N, 44°W. A ship near 40°N, 71°W had 20-ft swells. The NEW ZEALAND ALLIANCE (43°N, 61°W) measured 45 kn south winds. By 1200 on the 2d the LOW was 990 mb and circular as it eroded into the west side of the HIGH. The TFL FREEDOM (39°N, 67°W) measured 30-kn southwest winds, 12-ft seas, and 20-ft swells. The LOW was at 41°N, 68°W. On the 3d the storm drifted eastward as the HIGH drifted southeastward. The AMCO VOYAGER (41°N, 52°W) found 35-kn south winds, 17-ft seas, and 23-ft swells. The SEDCO 706 measured 50-kn south winds but no waves were reported (fig. 42).

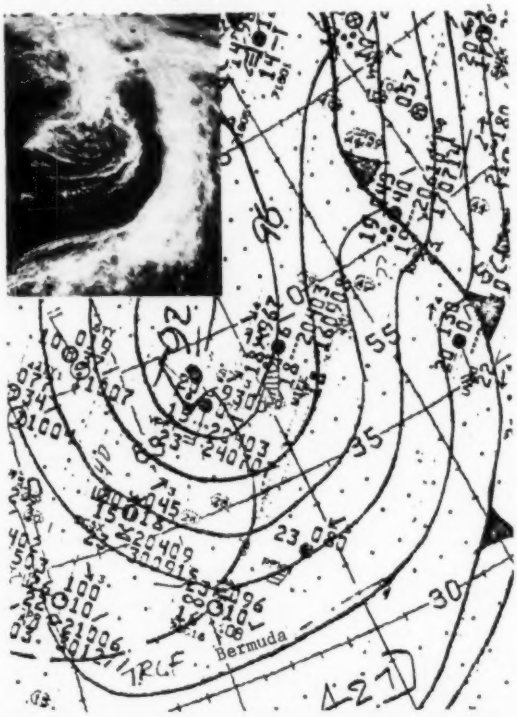


Figure 42.-- A section of the surface analysis for 1200 June 3, 1984 with an inset of the satellite image for 1600.

Figure 43.-- High waves are lapping the gunwales of the British barque MARQUES at the start of the Tall SHIP race. Only 9 of the crew 28 were rescued alive. WIDE WORLD PHOTO.

The British aux barque MARQUES (fig.43) sank near 33.9°N, 64.6°W on the 3d while participating in the Tall Ships Race from Bermuda to Halifax. She was reportedly knocked down in 35-kn west winds and 12-to 15-ft seas. The vessel then flooded rapidly. Other reports said a squall hit the ship with storm-to hurricane-force gusts. Nine of the crew of 28 were rescued alive. On the 6th the JENNIES with a cargo of iron pipes sank in this storm in high seas at 38.6°N, 49.3°W. All the crew were rescued by the Russian AKADEMIK YURYEV.

At 1200 on the 4th the storm was 974 mb near 46°N, 52°W and moving north. The AMCO VOYAGER now had 35-kn west winds, 8-ft seas, and 28-ft swells. The CARINA SMITS (38°N, 44°W) had 44-kn south winds, 5-ft seas, and 33-ft swells. The storm was weakening on the 5th. The RAINBOW HOPE (45°N, 56°W) measured 45-kn northwest winds and 26-ft waves. A Danish ship at 59°N, 46°W measured 54-kn east winds. On the 6th, CHARLIE measured 40-kn south winds and 13-ft waves. The LOW dissipated early on the 8th.

This potential storm formed over wyoming on the 11th. The storm center moved over Nova Scotia on the 15th. A French ship near 48°N, 60°W measured 40-kn winds. The LUCY MAUD MONTGOMERY (46°N, 62°W) also measured 40-kn north winds. On the 16th the RIGGS near 44°N, 60°W also measured near 40-kn winds. The storm was racing northeastward and moved pass Iceland on the 17th. It was over the Barents Sea on the 21st.

Great Slave Lake was the birth place of this LOW on the 14th. It moved eastward and was over the Labrador coast on the 17th. The BESKYTTEREN near Kap Farvel measured 40-kn winds. On the 18th the LAKESHELL (51°N, 58°W) in the Strait of Belle Isle had 47-kn north winds. CHARLIE measured 44-kn southwest winds with only 8-ft seas. On the 19th the storm passed over southern Greenland. CHARLIE now had 48-kn west winds and 10-ft seas. On the 20th the W.C.VAN HORNE (60°N, 34°W) measured 22-kn winds with 20-ft swells. The storm was over the Greenland Sea on the 23d.

The southern tip of James Bay brought forth this cyclone on the 18th. The southerly circulation was off the Maritime Provinces on the 19th. The EGLANTINE (48°N, 49°W) measured 44-kn winds from 200°. At 1200 on the 20th, the storm was 998 mb over eastern Quebec. The PACIFIC CHALLENGE (41°N, 54°W) had 19-kn southeast winds, 8-ft seas, and 25-ft swells. The RIGG at 44°N, 60°W measured 51-kn north winds. SEDCO 706 measured 40-kn south winds on the 21st. The storm collapsed on the 22d on the east Greenland coast.

This LOW formed in an area of weak gradient east of Cape Hatteras on the 19th. The LOW moved eastward and then northeastward. At 1200 on the 22d it was 1001 mb near 42°N, 53°W. The PENTHIEVRE at 41°N, 55°W had measured 36-kn winds with 20-ft seas at 0000. CHARLIE measured 52-kn south winds with 13-ft waves. A Canadian ship at 46°N, 49°W measured 60-kn south-southeast winds and 12-ft seas at 1800. SEDCO 706 at 47°N, 48°W measured 52-kn south winds and 12-ft seas. On the 23d the CGDR in Notre Dame Bay measured 60-kn northwest winds. CHARLIE measured 52-kn south winds and 12-ft waves at 1500. The storm disappeared over the Denmark Strait on the 24th.

The Gulf Stream east of Norfolk, Virginia was a factor in the development of this LOW. It was first analyzed as a frontal wave on the 0000 chart of the 26th. Reports from the NRFB and CGDJ helped indicate the wave had formed. The AMCO TRADER (40°N, 61°W) found 40-kn southeast

winds with 13-ft waves. The RAINBOW HOPE (42°N, 65°W) measured 30-kn winds, 12-ft seas, and 23-ft swells. At 1200 on the 27th the storm was 1002 mb over Miramichi Bay on the Gulf of St. Lawrence. The KFPN (44°N, 58°W) measured 45-kn east winds and 15-ft seas. Other ships and platforms in the area were reporting winds in the low 40's and waves of 10 to 15 ft.

The LOW came very close to disintegrating on the 28th, but it strengthened over water on the 29th. At 1200 it was 1000 mb. The storm died out on July 1.

CASUALTIES--These ship casualties were involved in fog. The ALMERIA STAR and SERVIA collided in the mouth of the scheldt river on the 14th. The BORGO and TAUNUS collided off Cape St. Vincent on the 16th. The KOLDOBIKA and CAPE CORNWALL collided off Cape Prior on the 20th. The FLAMENGO damaged dolphins while entering Holtenau Locks in fog on the 7th.

Another Tall Ships Race vessel, the JACQUES CARTIER had all masts broken and rigging lost 400 mi from Halifax on the 11th.

The yacht MIREBEL was caught in this same storm. The four sailors broadcast a "Mayday" call on June 1. They were picked up by the OMOA about 360 mi east of Cape Hatteras in seas of 15 to 20 ft and winds up to 43 kn. The salvage vessel AMERICANA picked up the MIREBEL.

The RIGEL had weather damage on the 3d, apparently in the St. Lawrence River. The LOK VIVEK had weather damage on the 13th. The THUROSUND grounded on the 14th in force 8 to 9 winds at Guldborgsund.

The MAYA dragged anchor in bad weather at Piraeus on the 1st. The NIKOLETA K. contacted a pier at Bremerhaven on the 23d. The KAPTAI alleged heavy weather June 23 to 25. The QUO VADIS encountered heavy weather and diverted to Norfolk.

Other Casualties--The YEE CHANG No. 3 sank near 34.5°S, 44.6°W in 54-kn winds and seas over 30ft on the 27th. The fishing vessel NAN YUNG sank at 33.4°S, 17.2°E on June 20 in heavy weather with a full load of fish.

North Pacific Weather Log

April, May and June 1984

WEATHER LOG, APRIL 1984--The storm tracks this month were spread out over a wide latitude band from 30°N to 50°N on the west and 40°N to Alaska coast on the east. There was a slightly concentrated track from 35°N, 165°E northeastward to the Queen Charlotte Islands. There were about the average number of cyclones.

The mean sea-level pressure chart (fig. 44) indicated a two center Aleutian Low. One center was 1006 mb near 55°N, 148°W, and the other was 1008 mb near 50°N, 172°W. Climatology indicates 4 centers between 53°N and 60°N and the Gulf of Alaska and Seas of Okhotsk at 1009 and 1010 mb. The Pacific High was 1027 mb, 4 mb higher than normal at 32°N, 147°W, and normally located. There was an anomalous 1023 mb HIGH from Honshu to northeastern Siberia.

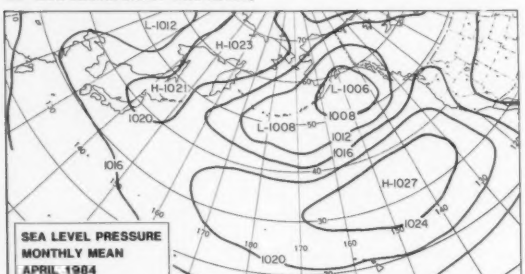


Figure 44.-- Mean sea-level pressure.

The northeastern ocean had negative pressure departures, two minus 6 mb centers at 52°N, 142°W and 47°N, 167°W. The Pacific High produced a plus 4 mb departure center near 30°N, 150°W. The anomalous HIGH produced a plus 10 mb anomaly center near 56°N, 145°E over the Sea of Okhotsk.

The upper-air pattern at 700 mb was primarily zonal between latitudes 30°N and 50°N from coast to coast. There was a deep-sharp trough along longitude 165°W from a LOW at 62°N, to 50°N. There was the usual ridge along the Coastal Mountains of Canada and Alaska. The anomalous surface HIGH over the Sea of Okhotsk was reflected as a ridge in the upper air. The midocean gradient between 30°N and 50° was tighter than normal.

Extratropical Cyclones--The month began with strong high pressure across the mid-latitudes. At midweek there were two strong HIGHs off each coast and a strong LOW over midocean. At the end of the week there was a strong Pacific High and strong LOWs over the Gulf of Alaska and east of the Kurile Islands.

The strong Pacific High persisted off California the second week with another HIGH over the Sea of Okhotsk. A large LOW over midocean later increased in intensity over the Gulf of Alaska. By midweek the cyclones were weak but the HIGHs persisted. At week's end a 1038 mb HIGH was over the central ocean and the Pacific High had weakened. There was a strong LOW east of the Kurile Islands.

The third week the Pacific High again strengthened but otherwise the systems were weak. By midweek one of the LOWs had intensified over the Gulf of Alaska. The end of the third week again found weak LOWs and a strong Pacific High with another over the Kurile Islands.

The high pressure continued into the fourth week with a 1036 mb HIGH near 40°N, 145°W and a 1039 mb HIGH near 52°N, 160°E. At midweek a strong LOW had developed near 43°N, 165°W between the two HIGHS. At the end of the week the large LOW was centered near Atka Island but was weak. The end of the month brought the cycle back to strong HIGHs and weak LOWs.

A frontal wave formed southeast of Tokyo late on April 1. Some strong gales were already

blowing on the 2d. At 0000 on the 3d the storm was 986 mb near 39°N, 167°E. The MEERDRECHT (35°N, 162°E) had 52-kn northwest winds and 30-ft swells. The AMERICAN APOLLO (35°N, 160°E) had 40-kn with 25-ft seas. On the 4th, the SEA-LAND EXPLORER (40°N, 177°E) reported 70-kn west winds with 44-ft seas and swells. The RUHR EXPRESS (45°N, 178°E) reported 65-kn west winds and 39-ft swells. The FUKURAWA MARU (41°N, 180°) had 57-kn winds. The storm was 964 mb near 48°N, 179°E). By 1200 it was 950 mb near 53°N, 177°W (fig 45). The RUHR EXPRESS now had 33-ft swells.

By 0000 on the 5th the central pressure had risen to 964 mb. The BUNGA MELAWIS (49°N, 176°W) had 55-kn winds from 250°with 25-ft seas. The NEPTUNE AMBER (50°N, 164°E) reported 78-kn northwest winds. At 0000 on the 6th the storm was over the Bering Sea. The storm was weakening and decreasing in size. A ship near 48°N, 179°W had 36-ft seas and another near 53°N, 166°W had 20-ft swells. The storm circled to the west and then south and was gone by the 7th.

Figure 45.-- The higher reported winds on the 4th were under scattered to broken clouds. NOAA 7.

The point of occulusion of a frontal system started this potential severe storm, on the 5th. The SUN ELL (40°N, 156°E) found 55-kn east winds at 0000 on the 6th. At 1200 on the 6th the storm was 980 mb near 42°N, 160°E. The PRESIDENT JEFFERSON (38°N, 164°E) had 48-kn south winds. On the 7th the KYOKUSHO MARU (41°N, 161°E) had 40-kn winds and 20-ft seas, Late in the day on the 7th another center formed at the occlusion east of the center. On the 8th the original center disappeared and the new one took over. The YORKSHIRE (48°N, 157°W) reported 64-kn winds with 20-ft swells. At 0000 on the 9th the storm was 962-mb near 53°N, 155°W. The CHEVRON CALIFORNIA (47°N, 152°W) had 46-kn winds from the west, 13-ft seas and 25-ft swells. The Yorkshire now had 54-kn northwest winds, 13-ft seas, and 33-ft swells. At 1800 the swells were 43-ft. Buoy 46003 reported 26-ft seas (fig. 46).

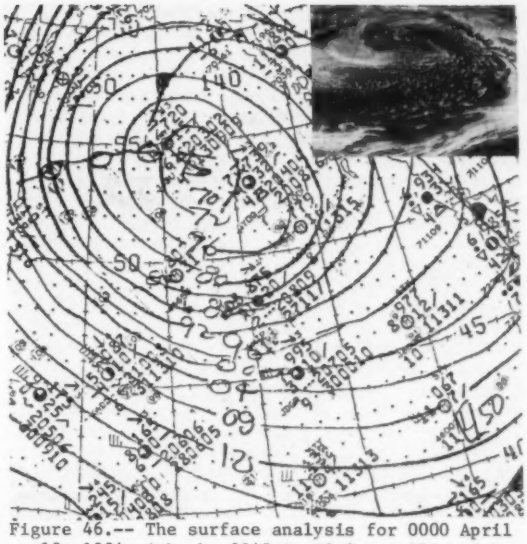


Figure 46.-- The surface analysis for 0000 April 10, 1984 with the 2045 April 9 satellite image inset.

On the 10th there were a lot of storm-force wind reports and high waves. The HANJIN INCHEON (47°N, 139°W) radioed 52-kn winds and 38-ft waves. The TAMA MARU had 39-ft waves at 54°N, 153°W. The storm started to weaken as it pounded against the coast and died on the 11th.

This was a short-lived storm. It formed as a frontal wave west of Portland Oregon and was first analyzed on the 0000 chart of the 6th. A ship that appeared to be the WILLIS WAVE provided the principal observation that identified its formation. Twenty-four hours later it was a vicious storm off Vancouver Island. At 0000 on the 7th the storm was 968 mb near 50°N, 140°W. There were many gale-and storm-force wind reports. Two were near 60 kn. The YOUNG SCOPE (48°N, 139°W) had 58-kn southwest winds and the WILLIS WAVE 48°N, 141°W) had 59-kn west winds with 39-ft waves. At 1200 buoy 46004 measured 25-ft seas. At 1800 the SHIN BEISHU MARU (53°N, 139°W) reported 40-kn northwinds 23-ft seas, and 51-ft swells. By 0000 on the 8th there were only gales and the storm disappeared by the 9th.

This storm formed over the Ryukyu Islands on the 10th. It gained a large weak circulation on the 11th and intensified on the 12th. The UNIVERSE (37°N, 160°E) had 51-kn winds from the east. A ship east of the center had 23-ft waves. At 1200 the storm was 976 mb near 40°N, 154°E. The CHIKABU MARU (38°N, 155°E) had 58-kn winds from 250°. The LUCID STAR (40°N, 158°E) had 55-kn winds but reported no seas. The DAIHO MARU (50°N, 161°E) had 49-kn southeast winds and 26-ft waves. On the 13th the storm was 970 mb. The higher winds were gale-force on the 14th with some 20-ft waves. The storm weakened rapidly on the 15th.

This storm was born as a frontal wave on the 14th. It raced northeastward and did not

become a significant storm until the 17th. At 0000 it was 974 mb near 50°N, 150°W. The CRYSTAL REED (48°N, 151°W) had 45 kn west winds, 12-ft seas, and 33-ft swells. There were storm-force winds on the 18th. The FUKUKAWA MARU (51°N, 132°W) had 48-kn southeast winds, 20-ft seas, and 33-ft swells. The GREAT LAND (51°N, 133°W) had 50-kn winds, 26-ft seas and 30-ft swells. At 0000 on the 19th the storm was 988 mb near 50°N, 138°W. The PRESIDENT TYLER (49°N, 151°W) had 45-kn northwest winds, 23-ft seas, and 41-ft swells. Later in the day the storm weakened rapidly and disappeared early on the 20th.

Frontal waves were occurring along a front from Taiwan to Kyushu on the 18th. On the 19th one that remained identifiable moved eastward from Kyushu. It produced only clouds and rain until the 23d when it started deepening. At 2100 on the 23d the DRAGOR MAERSK (44°N, 173°W) had 52-kn north-northeast winds and 23-ft seas. AT 0000 on the 24th she sent a STORM report of 70-kn northeast winds and 23-ft seas. The storm was 980 mb near 42°N, 171°W. There were two other MAERSK ships in the area. The LEDA MAERSK (42°N, 169°W) had southerly 45-kn winds and 23-ft seas, and the CHARLOTTE MAERSK (46°N, 171°W) had northerly 45-kn winds and 26-ft seas at 0600. The storm was 970 mb at 45°N, 167°W at 0000 on the 25th (fig.47) Cold Bay, Alaska had winds up to 40 mi/hr. The COLUMBIA HIGHWAY had 49-kn north winds, 26-ft seas, and 36-ft swells near 46°N, 173°W. Another SHIP near 50°N, 169°W had 50-kn northeast winds and 26-ft waves. Southeast of the center a ship measured 45-kn south winds and 20-ft seas.

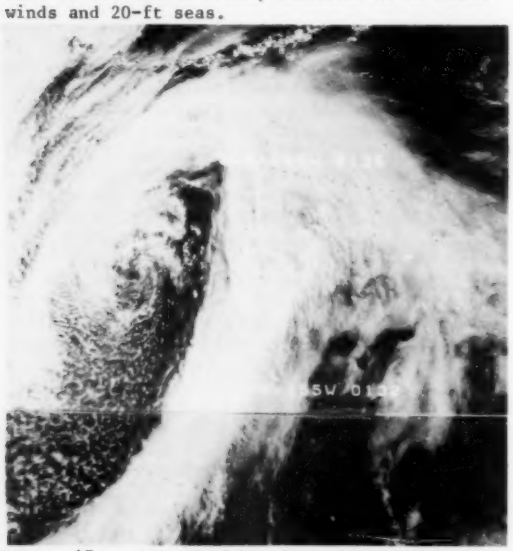


Figure 47.— A typical North Pacific storm. NOAA 7.

On the 26th the storm started drifting toward the northwest. The W. A. MATHER (44°N, 176°W) had 40-kn, 10-ft seas, and 33-ft swells. The storm weakened and on the 27th had a double LOW. The storm was gone on the 29th.

On the 23d the Pacific High was building toward the U.S. West Coast. At 1200 it was 1036 mb near 42°N, 140°W. A trough along the southern Alaska Coast kept that gradient tight. The PETERSBURG (52°N, 136°W) had 48-kn west winds, 33-ft seas, and 41-ft swells. The tight gradient along the California coast produced 45-kn winds for the EXXON PHILADELPHIA. There were strong gales off the West Coast on the 24th. The B.T. SAN DIEGO (35°N, 122°W) had northwesterly 49-kn winds and 26-ft waves. On the 25th the MANUKAI (37°N, 125°W) measured 49-kn north winds and 21-ft waves.

The SEALIFT PACIFIC had 42-kn north winds, 13-ft seas, and 36 ft swells.they were still 36-ft at 0000 on the 26th and the HIGH was 1038 mb centered near 39°N, 138°W. The B.T. ALASKA (35°N, 121°W) had 48-kn 330° winds and 15-ft waves. The STAR LUZON (48°N, 136°W) was north of the HIGH with only 9-kn winds from 110°, 5-ft seas, but the swells were 53 ft from 270°. The HIGH was slowly drifting toward the coast on the 27th but the pressure was decreasing. On the 28th the SHUKO MARU (37°N, 125°W) reported 50-kn north winds. This was the last report as the HIGH weakened and moved southward.

Casualties--The following ships collided in fog: the KOYO MARU No.5 and FERRY ORANGE in the Inland Sea, the SHINEI MARU no.5 and ISUZU MARU off Akashi Strait, the RAYA ECLAT and HWA PYUNG NAM JIN 3 mi off Waglan Island. The CISSUS struck a breakwater at Kobe in fog and the EXCELSIOR REEFER went aground near Hong Kong.

The DAIWA MARU No. 2 sank near Osaka Bay when she was swamped by a wave. Twelve people drowned when they abandoned the crippled ferry DONG NAM JUMBO FERRY in rough seas near Komun do off Pusan, Korea. There were 215 passengers aboard and the rest were rescued. Their lifeboat capsized when another ferry tried to rescue them.

The HYUNDAI No. 6 had weather damage on April 5. The PRESIDENT JACKSON lost 15 containers overboard due to high waves from Kobe to Seattle. The LISA A jack up barge capsized in heavy weather in southern Japan on the 30th.

Other Casualities--The HIND HASHIM had damage at Dammam when gusty winds blew her into a crane. The VIOLETTA lost 18 containers overboard out of Durban. Several lash barges were damaged in heavy weather at Chittagong on the 16th.

A bad storm with hurricane-force winds struck a 30 boat yacht race from Durban to East London on the 26th. Five members of the crew were missing. Only one yacht completed the 400-mi race. Two yachts sank an a third ran aground. Heavy seas overwhelmed the dhow SIKUDHANI near Pemba Island on the 30th. She had 15 passengers and 7 crew aboard. Only two survived who were washed ashore near Mombasa.

WEATHER LOG, MAY 1984--There appeared to be more than the usual number of cyclones over the North Pacific this month. There was a primary storm track from east of Tokyo eastward to about 180° and then northeastward to Vancouver Island. This was fairly close to the climatological primary storm path and it was more northeastward over the western ocean and ended near Dixon Entrance. The first week of the month four storms formed between latitudes 25°N and 30°N, relatively

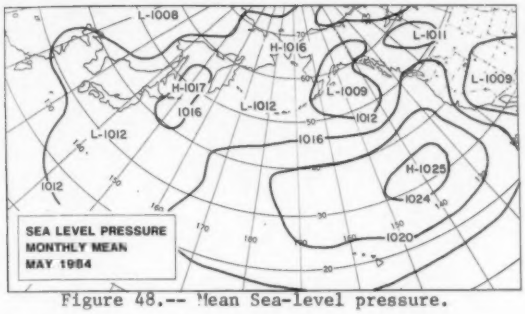


Figure 48.-- Mean Sea-level pressure.

far south for this time of year. Two storms tracked southeastward out of eastern Siberia and across the Bering Sea.

The primary Aleution Low at sea level was 1009 mb near 52°N, 145°W. This was an anomalous location, much further east than normal (fig. 48). According to climatology the primary LOW is 1007 mb over northern Manchuria with three 1009 mb LOWs along latitude 53°N over the Bering Sea. The Pacific High was near normal at 1025 mb near 32°N, 140°W. There was an anomalous 1017 mb HIGH over the Sea of Okhotsk and east of Hokkaido.

The sea-level pressure departure pattern featured a minus 5 mb anomaly center near 51°N, 140°W, and a minus 3 mb center near 32°N, 158°E. The anomalous HIGH produced a plus 7 mb anomaly center near 54°N, 145°E. There were two plus 3 mb centers, one near 31°N, 133°W and another over the southeast corner of Washington State.

In the upper air at 700 mb there was a zonal wind band about 15° latitude wide centered on 35°N over Japan to 42°N at Cape Blanco, Oregon. The primary center of cyclonic circulation was a LOW at 54°N, 151°W. The normal LOW is at 57°N, 178°E. The subtropic HIGH was normally positioned but about 48 meters higher than normal. This resulted in a slightly tighter gradient with stronger winds. There were two tropical cyclones over the eastern North Pacific, Alma and Boris.

Some Climatology. On May 18, 1980 Mount Saint Helens in Washington State erupted spewing ash and smoke 63,000 ft into the air.

Extratropical Cyclones--The month started out with two large-strong HIGHs that decreased in strength and size as the week progressed. The LOWs were weak. By the end of the week a strong LOW had developed west of Seattle and another east of the Kurile Islands. The high pressure configuration was normal.

The beginning of the second week the strong LOW was quasistationary over the Gulf of Alaska. The Pacific High was increasing in strength, but the other circulations were weak. The LOW had dissipated by midweek with high pressure over the central ocean. At the end of the week the HIGH was 1034 mb off Northern California and a strong 980 mb LOW was over Adak Island.

The 980 mb LOW dissipated over the Bering Sea the first of the thrid week. A frontal wave from Honshu speed eastward and intensified over the central ocean at midweek but weakened as it entered the Gulf of Alaska. The end of the week found only weak circulations.

As the fourth week started a frontal wave intensified as it entered the Gulf of Alaska. There were many weak LOWs and frontal waves. There were three HIGHs, the Pacific High, one over the central ocean, and another over the Kurile Islands. At midweek the Pacific High was strong with another at midocean. The LOWs were weak. By the end of the week the Pacific High was assimilated into a 1034 mb HIGH over the central ocean. Cyclones were weak. At the end of the month the HIGH was 1035 mb and had drifted to 42°N, 140°W. Other circulations were weak.

This frontal wave formed over the Date Line west of Midway late on the 2d. Observations from Midway and the ZENKOREN MARA No. 2 indentified that the wave had formed. Observations by ships that appeared insignificant by theirselves made it possible to track the weak frontal wave as it moved east-northeastward. It remained insignificant except for clouds and rain until the 6th when it started deepening. At 0000 on the 7th the storm was 988 mb near 46°N, 145°W. The STREAM HHAWSER ((50°N, 147°W) had 42-kn northeast winds with 33-ft seas. Later in the day there were many more severe weather reports. The KENWOOD (48°N, 137°W) measured 49-kn southeast winds and 25-ft waves. At 0000 on the 8th the storm was 976 mb. The winds were generally in the gale to strong gale category but many reports of waves up to and over 20 ft. The FORT RESOLUTION (45°N, 146°W) had 50-kn west winds and 25-ft swells. The STREAM HAWSER (48°N, 153°W) had 47-kn north winds and 34-ft seas and swells. At 1200 buoy 46003 had 20-ft waves and the FORT RESOLUTION had 26-ft waves. At 0000 on the 9th the STREAM HAWSER (46°N, 154°W) was on the southwest edge of the storm and still reporting 34-ft waves. The winds around the storm were gale-force or less but waves of 15 to 25 ft were still occurring, especially around the southern half of the storm. At 1200 buoy 46005 measured 20-ft seas. The storm was gone by the 11th.

This storm was a combination of several cyclones. Two joined together to form the original storm and then it split into separate centers again. A LOW from the Tsugaru Strait and another from 31°N, 157°E combined on the 12th into one 986-mb storm near 43°N, 168°E. Gale-force winds were blowing mainly south of the center. The CHIKURA MARU (36°N, 167°E) had 54-kn west winds and 18-ft waves at 0600. At 2100 the winds were 34-kn from the northwest and the waves had increased to 20-ft.

At 1200 on the 12th another center had formed northeast of this one and by 0000 on the 13th was the new storm center. The winds were still mostly gales and the waves below 20 ft. The AVILA (54°N, 165°W) measured 51-kn southeast winds. At 0000 on the 14th the storm was 980 mb near Adak Island. The TOWER BRIDGE (45°N, 155°W) measured 39-kn south winds and 20-ft waves. The storm was weakening on the 15th and disappeared on the 17th.

MONSTER OF THE MONTH--China exported this frontal wave. On the 13th it was over the Sea of Japan. It raced eastward and there were some gales on the 15th. It sailed south of the storm described above late on the 15th. At 0000 on the 16th the storm was 976 mb near 46°N, 175°W. The winds had

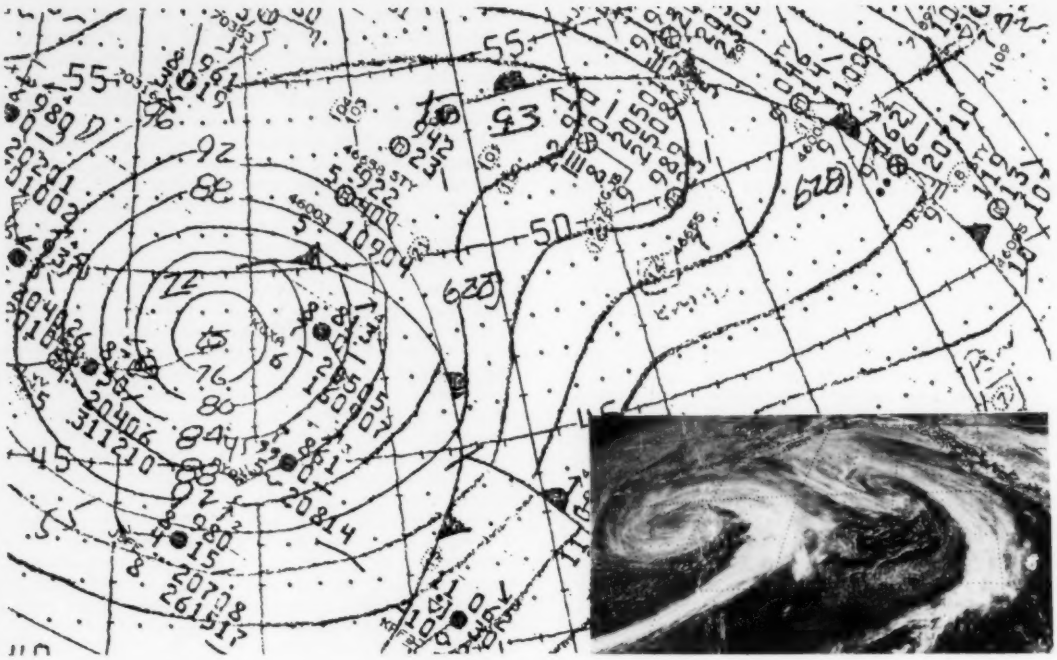


Figure 49.-- The surface chart for 0000 May 17, 1984 and the SMS/GOES image for 2045 May 16.

increased to storm force. The BOGASARI DUA (42°N, 177°E) had 50-kn northwest winds and 30-ft seas. The CHARLOTTE MAERSK (45°N, 168°W) found 50-kn west winds and 36-ft seas. At 0000 on the 17th the storm was 972 mb and still relatively small (fig. 49). The CHIKURA MARU (43°N, 163°W) measured 53-kn west winds and 28-ft waves. The CHARLOTTE MAERSK now estimated 45-kn winds but the seas were still 36 ft. At 1800 the CHASTINE MAERSK (46°N, 152°W) had 50-kn winds and 20-ft seas.

The storm was weakening as it entered the Gulf of Alaska, on the 18th. The FAIRWEATHER (57°N, 156°W) near Kodiak measured 40-kn northeast winds. The KJEJ (50°N, 129°W) measured 60-kn southeast winds but only 13-ft waves. Not far away the SEA BELLS measured 55-kn winds and 12-ft waves. The system quickly fell apart on the 20th.

This frontal wave also came out of China on the 15th on the same frontal system that generated the storm above. On the 17th the OCEANIA MARU (34°N, 154°E) found 40-kn winds as the frontal wave raced eastward under zonal flow. The cyclone was not of much consequence until the 21st when it started to deepen. At 0000 on the 22d it was 986 mb near 42°N, 144°W. The CRYSTAL STAR (43°N, 145°W) measured 58-kn southwest winds with 17-ft waves. The ASIA MARU (43°N, 144°W) measured 48-kn west winds and 26-ft waves. The 6MCB (46°N, 135°W) measured 45-kn west winds with 25-ft waves. The THOMPSON PASS (49°N, 127°W) found only 30-kn winds but the waves were also 25 ft. By the 24th the storm had pounded itself out on the coastal mountains.

High pressure pushed against the U.S. West Coast on the 24th. This produced a tight gradient due to the coastal mountains and the usual thermal LOW east of the mountains. Several ships found northerly gale-force or higher winds and waves up to 20 ft.

On the 24th the SURVEYOR (40°N, 124°W) measured 40-kn northwest winds and 17-ft swells. The AMERICAN SUN nearby measured the same winds but 20-ft seas and 26-ft swells. On the 25th and 26th a LOW moved into the PORTLAND area interrupting the system. On the 27th the HIGH had settled back in place again. The AMERICAN AQUARIUS (37°N, 124°W) had 35-kn winds and 20-ft waves from the northwest. The AMERICAN MONARCH had only 20-kn north winds on the 28th but the swells were 20 ft. The CORNUCOPIA (47°N, 132°W) had 20-ft swells. The EXXON NEW ORELANS (38°N,

Figure 50.-- Pacific High off the Oregon Coast.

124°W) measured 50-kn northwest winds and 17-ft waves on the 31st (fig. 50). On June 1 the winds were 55 kn. The gradient gradually lessened as the HIGH drifted southward.

Casualties--Fog caused three of the four casualties this month. The SEA CARRIER sank after colliding with the JIN XIAN QUAN off Taishan Islands.

The SHINRIKI MARU No. 2 contacted the BELA MONDO off Ogi Shima Light in fog. The TAIZAN MARU and KONPIRA MARU collided off Awaji Shima.

The SATSUKI MARU No. 11 shipped seas and capsized and sank off the port of Tokyo lighthouse.

Other Casualties--The topmast broke loose from the mainmast on the LAKE HUME in heavy weather on the 9th between Brisbane and Port Kembla. The ORIENTAL EXPERT lost the port anchor and 11 shackles of cable on May 5 during heavy swell while anchored off Sydney. The COSTAIN 3 swamped in gale-force winds and sank at her mooring at Farazan Island on May 25.

WEATHER LOG. JUNE 1984--This was a rather normal month as far as weather over the North Pacific was concerned. There appeared to be the average number of cyclones. There were more in the first and fourth weeks than during the middle of the month. There was a primary storm track during the first week that stretched from about 30°N, 170°E to 40°N, 165°W. This track was about 7° latitude south of the normal track. The last week of the month there was a three storm track from near Tokyo to about 39°N, 160°E. There was a widely dispersed track from slightly south of Adak Island into the Gulf of Alaska.

The mean sea-level pressure pattern was near normal, except for an anomalous 1021 mb HIGH near 35°N, 175°E (fig. 51). The Aleutian Low was 1006 mb near 52°N, 177°W. This was 4 mb lower than normal and within a few miles of its normal location. The Pacific High was 1026 mb near 35°N, 142°W. It was 2 mb higher than normal and 200 mi east of its normal position.

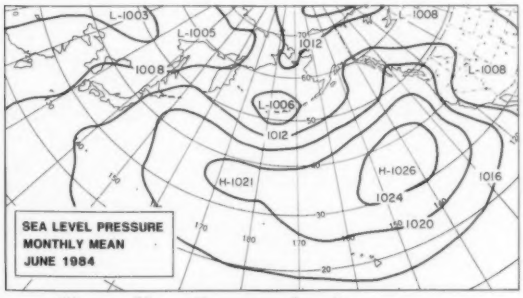


Figure 51.-- Mean sea-level pressure.

The anomaly analysis showed a minus 5 mb center near 54°N, 176°W; a plus 6 mb center near 40°N, 160°E; and a plus 3 mb center near 40°N, 130°W.

The 700 mb height chart could almost have been traced from the normal. The LOW was 2,907 meters near 52°N, 177°W and the HIGH 3,218 meters near 30°N, 153°W. The slope or gradient was 311 meters compared to the normal 236 meters. There was an anomalous HIGH centered near Fairbanks Alaska.

There were two tropical cyclones over the western North Pacific, Vernon and Wynne. The eastern North Pacific supported three, Cristina, Douglas, and Elida.

Extratropical Cyclones--The month started out with the Pacific High near 40°N, 130°W, further north than normal. Another HIGH was east of Hokkaido and a LOW was centered over the central Aleutians. The Pacific High moved southward to its normal position by midweek as the western HIGH remained stationary and built. At the end of the week most of the ocean was dominated by high pressure. There were some weak LOWs and frontal waves. Stable frontal waves had moved along an old front paralleling latitude 30°N all week.

The second week was a continuation of the first week except the frontal waves along 30°N no longer occurred. The western HIGH was moving eastward. At midweek the Pacific High was 1031 mb near 42°N, 135°W and the western HIGH was 1030 mb near 38°N, 158°E. A LOW had developed between and north of the HIGH centers. At the end of the week the LOW was south of Kodiak, Alaska and the western HIGH was centered over midocean.

The third week most of the ocean was dominated by a large two center HIGH. The only significant cyclone was over the Yellow Sea. At the end of the week the high pressure was breaking down and a large LOW was east of Mys Lopatka.

This LOW moved eastward the fourth week along latitude 55°N. Another LOW was developing east of Honshu and following the LOW above. At end of the week HIGHs were centered along latitude 35°N and east of the Date Line. Another LOW came off Honshu near Tokyo and intensified as it traveled northeastward. At the end of the month the Pacific High was 1033 mb. There were several weak LOWs.

On the 1st and 2d the Pacific High at about 1034 mb was pressing against the California Coast and a 1008 mb thermal LOW was over southern California. This produced strong northerly winds and high waves along the coast. The CHEVRON OREGON (40°N, 125°W) measured 45-kn winds from 340° with 15-ft seas and 23-ft swells. At 1700 on the 1st the THOMPSON PASS (39°N, 126°W) had 35-kn winds from 360° and 25-ft seas and swell. At 0600 on the 2d the CHEVRON OREGON now at 42°N, 125°W measured 40-kn winds, 13-ft seas, and 20-ft swells. At 1800 the TONSONIA (40°N, 125°W) measured 40-kn 340° winds, 15-ft seas, and 18-ft swells. The gradient relaxed on the 3d.

This LOW developed over the central Aleutians on the 9th north of and between two HIGHs. At 0000 on the 11th it was 1001 mb, near 50°N, 174°W. The NEPTUNE AMBER (46°N, 175°E) measured 39-kn northwest winds. At 0600 the JAPAN ALLIANCE (51°N, 180°) measured 48-kn north winds and 10-ft waves. At 0600 on the 13th the TARASCO (44°N, 160°W) had 36-kn west winds and 12-ft seas. At 1800 the U.S. Coast Guard vessel FIREBUSH reported 12-kn east winds and 20-ft swells. At 0000 on the 14th the LOW was 994 mb near 55°N, 152°W. The KOREAN

AMETHYST (52°N, 151°W) measured 53-kn southwest winds. The WESTWARD VENTURE (56°N, 143°W) measured 19-kn southeast winds with 28-ft swells. The storm weakened on the 15th as it moved over the Gulf of Alaska and was gone by the 16th.

From the 14th through the 17th the Pacific High was again pushing toward the northern California coast producing a tight gradient. On the 14th at 0000 the B.T. SAN DIEGO off Cape Mendocino measured 40-kn 340° winds and 13-ft waves. The ATIGUN PASS was in the same area at 1200 with 25-kn 340° winds and 7-ft seas with 26-ft swells, At 0000 on the 15th the OVERSEAS JUNEAU also near Cape Mendocino found 35-kn winds from 320°, 20-ft seas, and 33-ft swells. On the 17th the GALLEON PRIDE off San Francisco measured 29-kn winds from 300°, and 20-ft seas and swells. The gradient relaxed on the 18th.

The point of occulsion of an old frontal system produced this LOW near Ostrov Iturup on the 18th. The storm moved northeastward and at 0000 on the 21st was 982 mb near 54°N, 169°E. At that time the JAPAN RAINBOW was near 50°N, 162°E and measured 47-kn west winds. The GREEN AUKLET (53°N, 179°E) measured 27-kn southeast winds and 20-ft waves. On the 22d the 974-mb storm was near 56°N, 171°E. The GOLDEN GATE BRIDGE at 49°N, 161°E measured 37-kn west winds, 12-ft seas, and 20-ft swells. Later in the day the PRESIDENT WASHINGTON (52°N, 178°E) found 33-kn southwest winds, 15-ft seas, and 21-ft swells. The storm was now traveling eastward across the Bering Sea. Cold Bay, Alaska had 43 mi/hr southeast winds. On the 23d the DAIHO MARU (50°N, 179°E) measured 40-kn southwest winds, 13-ft seas, and 26-ft swells. On the 24th and 25th this was still a relatively large storm in area, but the central pressure was rising and the gradient weakening. By the 26th a second LOW had formed east of this one. The PACIFIC ARROW (45°N, 141°W) measured only 17-kn winds, 7-ft seas, but 25-ft swells. The storm stalled near 55°N, 150°W and disappeared on the 27th.

The Sea of Japan produced this frontal wave late on the 24th. It traveled eastward until the 26th when it turned northeastward. At 0000 it was at 38°N, 154°E. The HOKUSEI MARU (36°N, 155°E) measured 30-kn southwest winds, 13-ft seas, and 20-ft swells. The SCANDINAVIAN HIGVWAY (41°N, 160°E) measured 49-kn north winds and 15-ft waves.

On the 27th the YUKO MARU (46°N, 175°E) measured 45-kn east winds and 17-ft waves. The NICHIZAN MARU (48°N, 171°E) measured 55-kn north winds and 15-ft waves. Also the SEA-LAND ENDURANCE (49°N, 179°W) measured 41-kn southeast winds and 15-ft waves at 1200. The storm was at 47°N, 179°E (fig. 52). At 1200 on the 28th the 978-mb storm

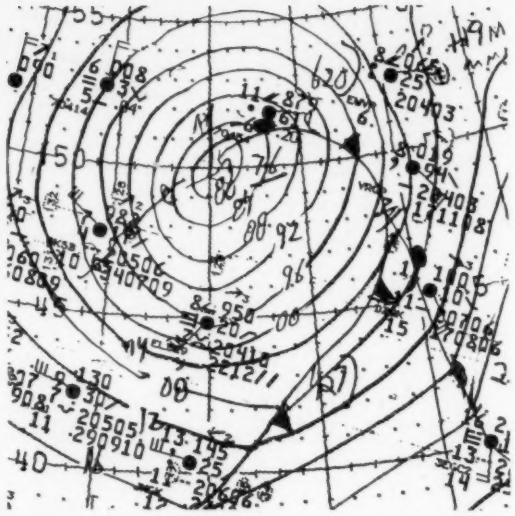


Figure 52.-- Surface analysis for 0000 June 28.

was at 52°N, 173°W. The SEA LIGHT had 42-kn winds and 18-ft waves. The SHIROTAE MARU (50°N, 179°W) found only 25-kn winds but the swells were 23 ft. On the 29th the BENLEDI (48°N, 168°W) had 47-kn winds and 17-ft waves. Another ship nearby had 20-ft waves. On the 30th the storm stalled near 55°N, 155°W and finally completely died out on July 3.

Casualties--The yacht ROYAL PRINCESS lost an engine in heavy seas south of the Queen Charlotte Islands, on the 27th, and took on water. Twenty people were evacuated from lifeboats by helicopters. The yacht apparently sank. The OCEAN EXPLORER contacted a wharf in heavy fog at Kushiro Hokkaido on the 7th. The DANAH dragged anchor in high winds at Yokohama and hit the BIZEN REEFER. The TAWU encountered heavy weather off Luzon. The WEASEL ran aground in heavy weather and rough seas enroute to Manila.

Other Casualties--The following ships encountered heavy weather in the North Indian Ocean: CHERRY LAJU, barge CG-581, DARYA LOK, TESUBU II, and a Thai trawler.

The COSEL L-43 lost cargo in heavy seas on a voyage from Port Moresby.

The SUN EAGLE I was at the Seychelles with hull damage from heavy weather.

The livestock carrier HAMAD AL KULAIB with 750 buffaloes sailed from Bombay on June 26. On the 29th it encountered heavy weather and developed a 35° list. The animals could not be driven back into their pens to help correct the list. The U.S. Navy rescued the crew.

Hurricane Alley

Dick DeAngelis
National Environmental Satellite,
Data and Information Service
Washington, D.C.

The tropical cyclone tracks (fig. 53) and the summaries are based on information provided by the Naval Environmental Prediction Research Facility and the Eastern Pacific Hurricane Center. Ted Tsui and Emil Gunther were most helpful. Table 6 summarizes activity for the 3-mo period while table 7 lists the tropical cyclones that have developed in 1984.

TROPICAL CYCLONES--APRIL 1984

Since a normal April sees about two tropical storms and one hurricane this year was slightly less active with just one tropical storm and a hurricane. Lance formed in the South Pacific while Kamisy was a South Indian cyclone. Both storms affected land areas.

Lance developed on the 5th in the Northern Coral Sea, south of the western tip of New Guinea. As a tropical storm he moved southward maintaining minimal tropical storm strength for most of his existence. At times maximum winds were estimated at 50 kn. Lance generated gale force winds and high seas along his path which took him close to Brisbane on the 8th. By this time he was turning extratropical but maintaining 50-kn winds.

While Lance was moving toward Australia on the 6th, Kamisy had already reached hurricane strength northwest of the Mascarene Islands. By early on the 8th,generating 100-kn winds, Kamisy was approaching northern Madagascar; gusts near the center were estimated at 125 kn and her circulation blanketed the northern half of the island. Early on the 9th Kamisy moved across the northern tip, turned back and crossed the island again. The damage caused by Kamisy was severe. In preliminary estimates at least 22 people died, several hundred were injured and 75 thousand were left homeless. Damage was estimated at over $100 million. Antsiranana, a major northern town, was raked by 130-kn winds. The port of Mahajunga on the northwest coast was hit twice. The SISAL TRADER was reported grounded on a reef on the 11th near Mayotte in the Camoro Islands. The crew it seems abandoned the vessel.

TROPICAL CYCLONES--MAY 1984

Two tropical storms and one hurricane developed during the month. This is about average with the eastern North Pacific picking up the slack caused by inactivity in the west. The highlight of the month was a rare tropical cyclone making its way into the Gulf of Aden. A tropical cyclone usually approaches or crosses the Arabian coast about once every 3 yr and even fewer make it into the Gulf of Aden. This years tropical cyclone developed southeast of Socotra island on the 23d and moved into the Gulf a few days later. Maximum winds climbed to 45 kn near its center on the 27th shortly before it made landfall near Djibouti.

Table 6. Global Tropical Cyclone Summary
April, May and June 1984

No.	Name	Est.Max Wind(kn)	Basin	Dates
		April 1984		
1.	Lance	40	Aust.-S. Pacific	3-8
2.	Kamisy	100	S. Indian	3-15
		May 1984		
1.	Alma	50	E. North Pacific	17-21
2.	Tc-1A	45	N. Indian	23-28
3.	Boris	65	E. North Pacific	28-6 Jun
				12-18 Jun
		June 1984		
1.	Vernon	40	W. North Pacific	7-11
2.	Cristina	90	E. North Pacific	17-26
3	Wynne	60	W. North Pacific	18-26
4.	Douglas	125	E. North Pacific	25-6 Jul
5.	Elida	115	E. North Pacific	28-8 Jul

Tropical storm Alma and hurricane Boris formed over the eastern North Pacific during the second half of the month. Alma followed a westerly course. Her maximum winds climbed to 50 kn on the 19th. Boris enjoyed a double life and a rather meandering path. During late May and early June Boris moved erratically and never really got it together. By the 6th of June as a depression he seemed doomed. However a week later he regenerated and took on a more definite movement. Maximum winds reached 65 kn for a brief period on the 30th.

TROPICAL CYCLONES -- JUNE 1984

During this month an average of four or five tropical cyclones usually develop with two reaching hurricane intensity. The eastern and western North Pacific are usually the most active crew accounting for about 80 percent of the storms. This June there were five tropical cyclones (three of which reached hurricane intensity) all of which developed over the North Pacific. The three hurricanes were all eastern storms while the two tropical storms came to life in the west.

All three hurricanes were potent storms with maximum winds of 90 kn or more and a lifetime of at least 10 days. They all developed during the second half of the month. Christina formed the farthest north and remained north of the others. She was a hurricane from the 19th until the 21st with maximum winds reaching 90 kn on the 20th. While she was dissipating just north of 20°N, Douglas was coming to life near 10°N. On a classic track he moved steadily west-northwestward toward the Hawaiian Islands. Douglas reached hurricane strength late on the 27th about the time Elida was beginning to develop to the east. Douglas quickly became a large, potent storm. By early on the 29th he was generating 125-kn winds with gusts estimated at 150 kn and gales extending out 150 mi. Elida following in his wake reached hurricane

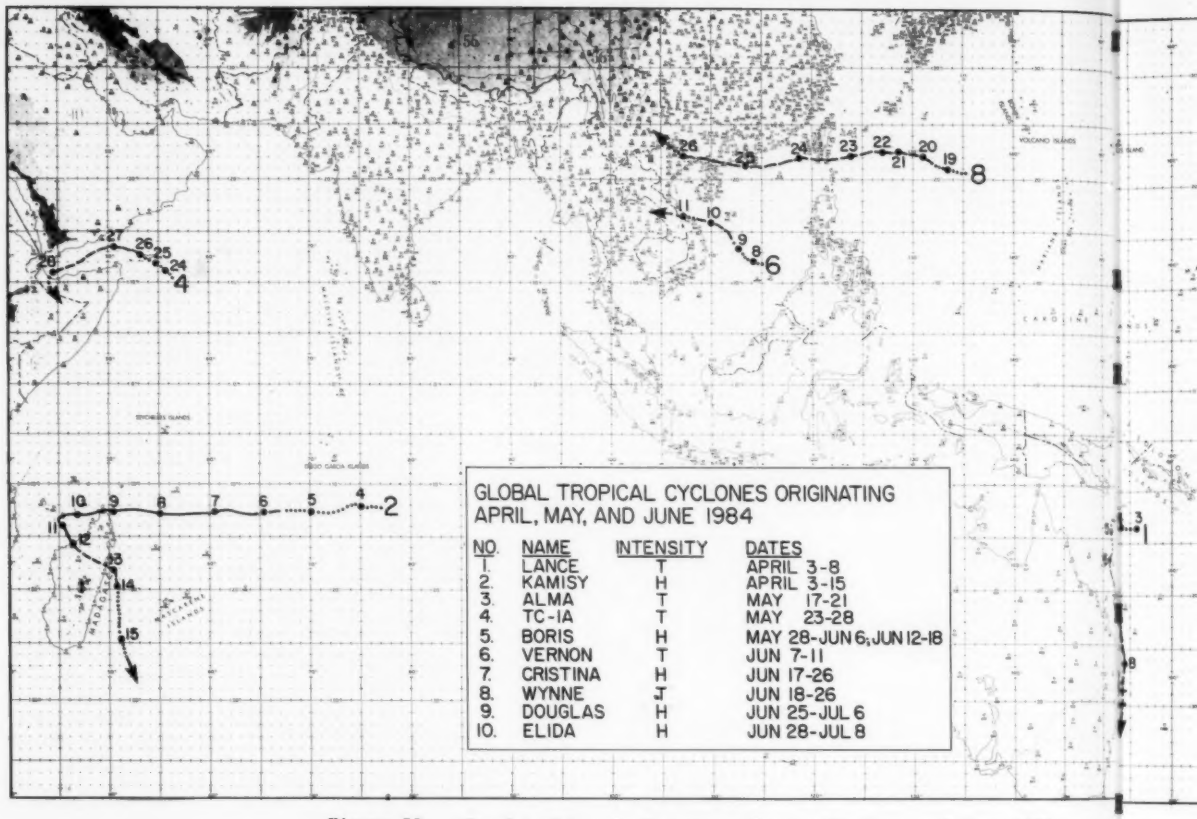

GLOBAL TROPICAL CYCLONES ORIGINATING
APRIL, MAY, AND JUNE 1984
NO. NAME INTENSITY DATES
1. LANCE T APRIL 3-8
2. KAMISY H APRIL 3-15
3. ALMA T MAY 17-21
4. TC-IA T MAY 23-28
5. BORIS H MAY 28-JUN 6, JUN 12-18
6. VERNON T JUN 7-11
7. CRISTINA H JUN 17-26
8. WYNNE T JUN 18-26
9. DOUGLAS H JUN 25-JUL 6
10. ELIDA H JUN 28-JUL 8

Figure 53.-- Tracks of tropical cycones for April, May, and June 1984.

intensity on the 30th near Clipperton Island. Her maximum winds climbed to 115 kn on July 1. Douglas weakened to tropical storm strength on July 2 as convection diminished and shearing became a problem. The following day he entered the central Pacific region. He threatened Hawaii but dissipated, before reaching the big island, on July 6. Meanwhile Elida, unlike Douglas, recurved on July 5 after losing hurricane strength a few hours before. By the 7th she was moving eastward and dissipating.

Tropical storm Vernon formed in the South China Sea on the 7th. After moving northwestward and intensifying he turned toward Vietnam. Maximum winds reached 40 kn on the 9th, the day before Vernon moved inland. About one week after Vernon dissipated, tropical storm Wynne popped up in the northern Philippine Sea. Heading westward Wynne reached tropical storm strength on the 19th. She crossed the southern tip of Taiwan on the 23d packing winds of 55kn. Peak winds reached 60 kn late on the 24th as Wynne skirted Hong Kong and headed for the south China mainland.

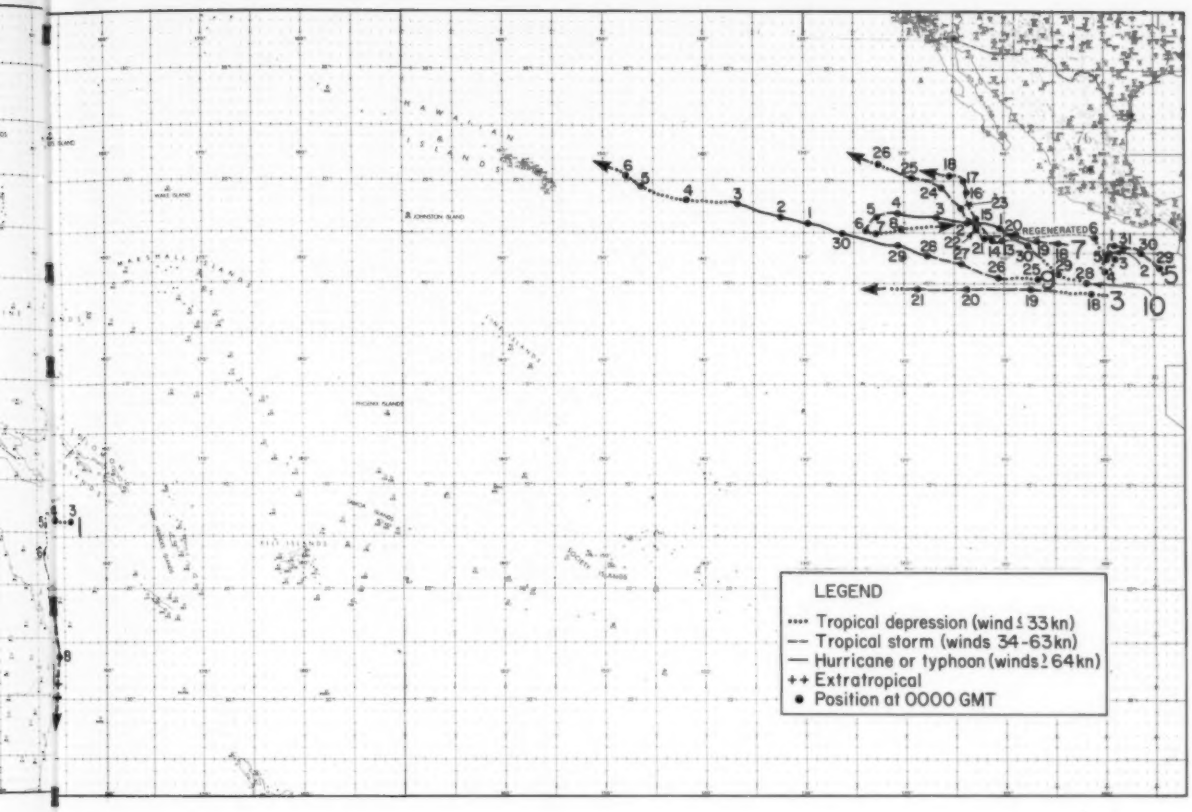

LEGEND
···· Tropical depression (wind ≤ 33 kn)
– – Tropical storm (winds 34-63 kn)
— Hurricane or typhoon (winds ≥ 64 kn)
++ Extratropical
• Position at 0000 GMT
REGENERATED

Table 6.-- Tropical cyclone watch, 1984.

Western North Pacific				
Vernon	Td	1W	T	June
Wynne	Td	2W	T	June
Alex	Td	3W	H	July
Betty	Td	4W	T	July
Cary	Td	5W	H	July
Dinah	Td	6W	H	July
Ed	Td	7W	H	July
Freda	Td	8W	T	Aug
Gerald	Td	10W	T	Aug
Holly	Td	11W	H	Aug
Ike	TD	13W	H	Aug
June	Td	14W	T	Aug
Kelly	Td	15W	H	Sept
Lynn	Td	16W	T	Sept
Maury	Td	17W	T	Sept
Nina	Td	18W	T	Oct
Ogden	Td	19W	H	Oct
Phyllis	Td	20W	H	Oct
Roy	Td	21W	T	Oct
Susan	Td	22W	T	Oct
Thad	Td	24W	H	Oct
Vanessa	Td	25W	H	Oct
Warren	Td	26W	H	Oct
Agnes	Td	27W	H	Nov
Bill	Td	28W	H	Nov

Eastern North Pacific				
Alma	Td	1E	T	May
Boris	Td	2E	H	May
Cristina	Td	3E	H	June
Douglas	Td	4E	H	June
Elida	Td	5E	H	June
Fausto	Td	7E	H	July
Genevieve	Td	8E	H	July
Hernan	Td	10E	T	July
Iselle	TD	11E	H	Aug
Julio	TD	12E	T	Aug
Kenna	TD	13E	T	Aug
Lowell	Td	15E	H	Aug
Marie	Td	16E	H	Sept
Norbert	Td	19E	H	Sept
Odile	Td	20E	H	Sept
Polo	Td	21E	H	Sept
Rachel	Td	22E	T	Oct
Simon	Td	23E	T	Oct

Central North Pacific				
Keli		01C	H	Aug
Moke			T	Sept

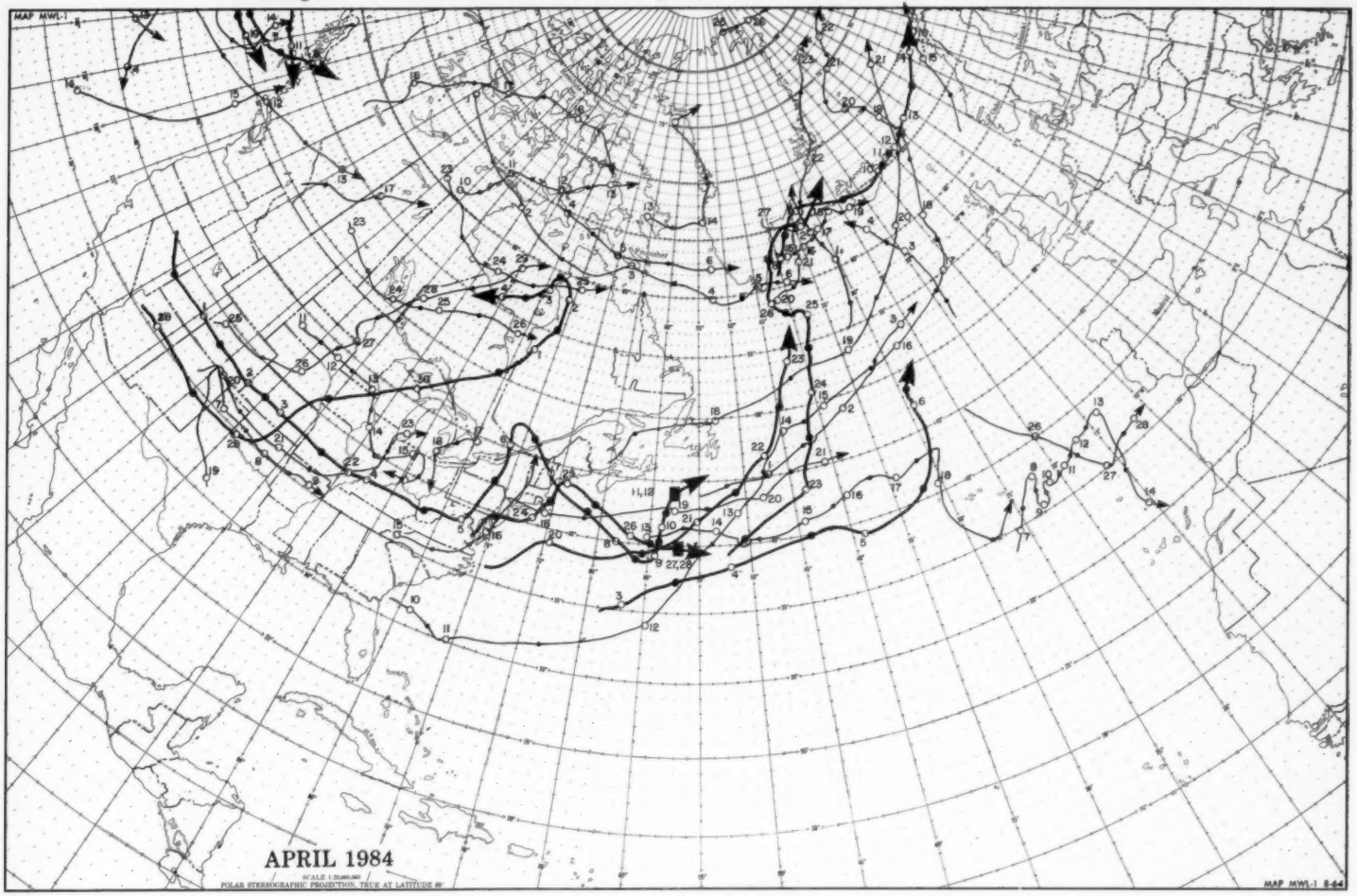
Australian-South Pacific				
Tim		11S	T	Jan
Grace		12P	H	Jan
Beti		16P	H	Feb
Harvey		17P	T	Feb
Willy		18S	T	Feb
Bobby		22S	H	Feb
Ingrid		23P	H	Feb
Chloe		24S	H	Feb
Jim		25P	T	Mar
Cyril		27P	T	Mar
Kathy		28P	H	Mar
Lance		29P	T	Apr

South Indian Ocean				
Domoina		13S	T	Jan
Edoara		14S	T	Jan
Vivienne		15S	H	Jan
Haja		19S	T	Feb
Annette		20S	H	Feb
Imboa		21S	T	Feb
Daryl		26S	H	Mar
Kamisy		30S	H	Apr

North Indian Ocean				
—	TC	1A	T	May
--	TC	2B	T	Oct

North Atlantic Ocean		
Arthur	T	Aug
Bertha	T	Aug
Cesar	T	Aug
Diana	H	Sept
Edouardo	T	Sept
Fran	T	Sept
Gustav	T	Sept
Hortense	T	Sept
Josephine	H	Oct
Klaus	H	Nov

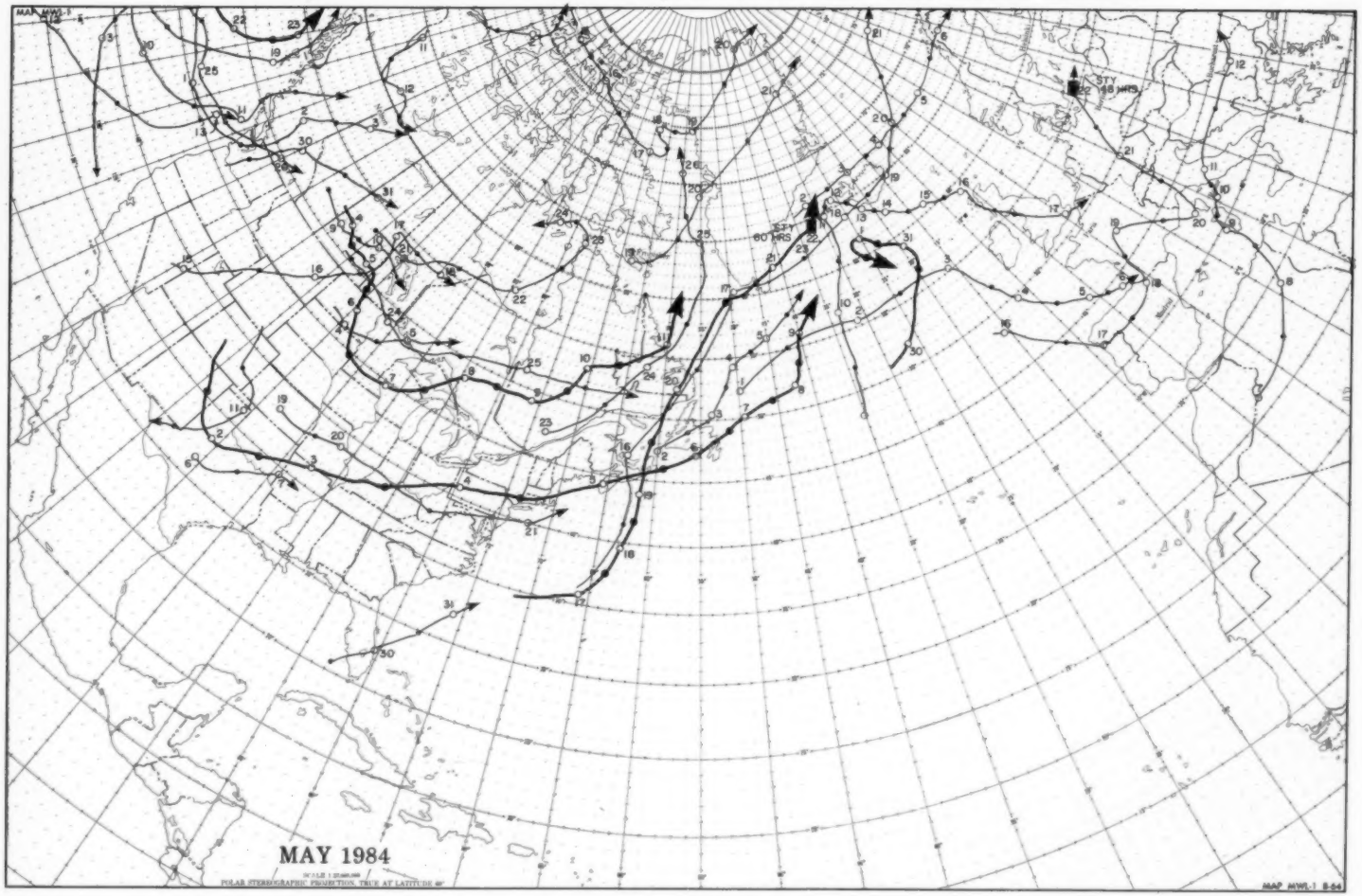
Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



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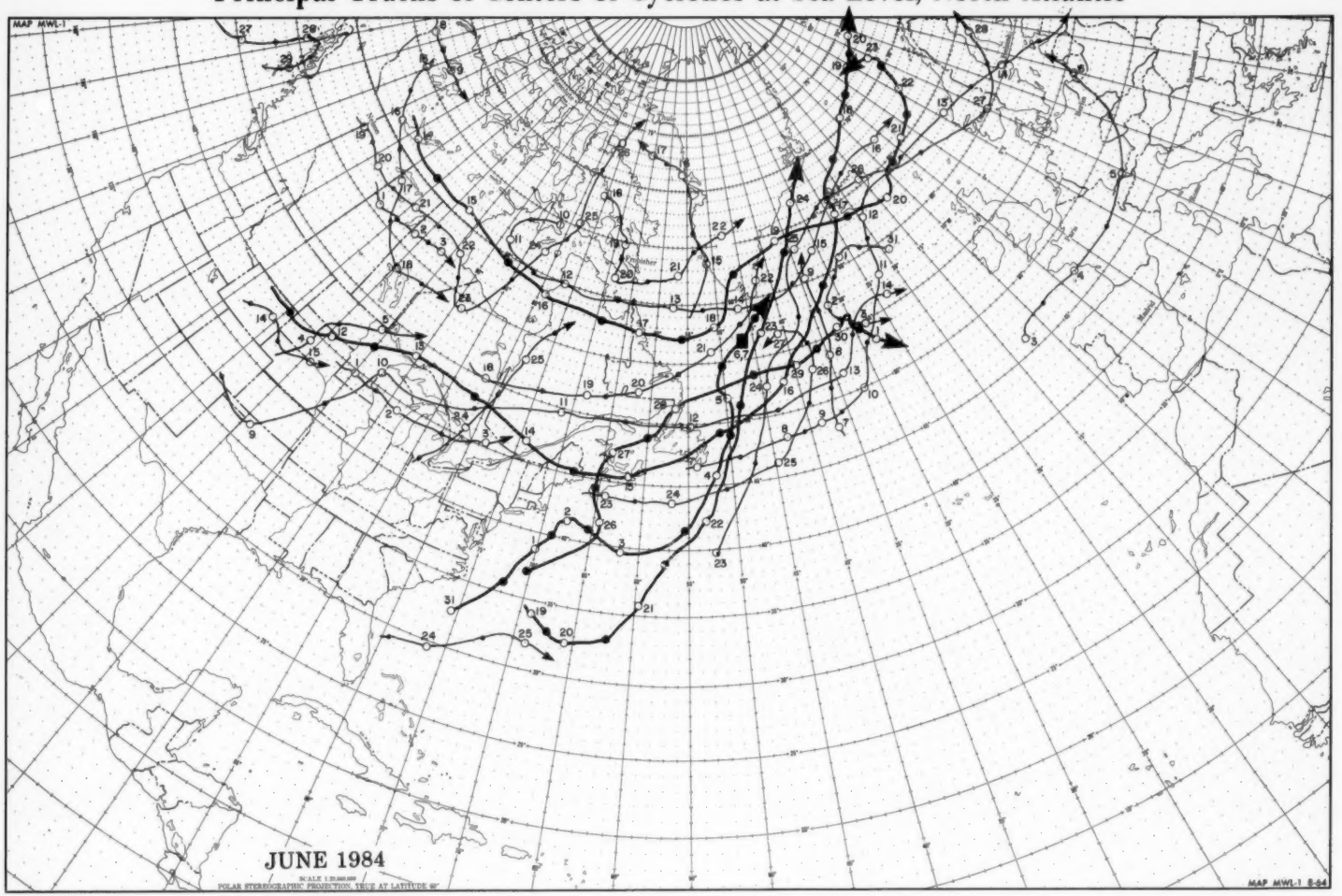
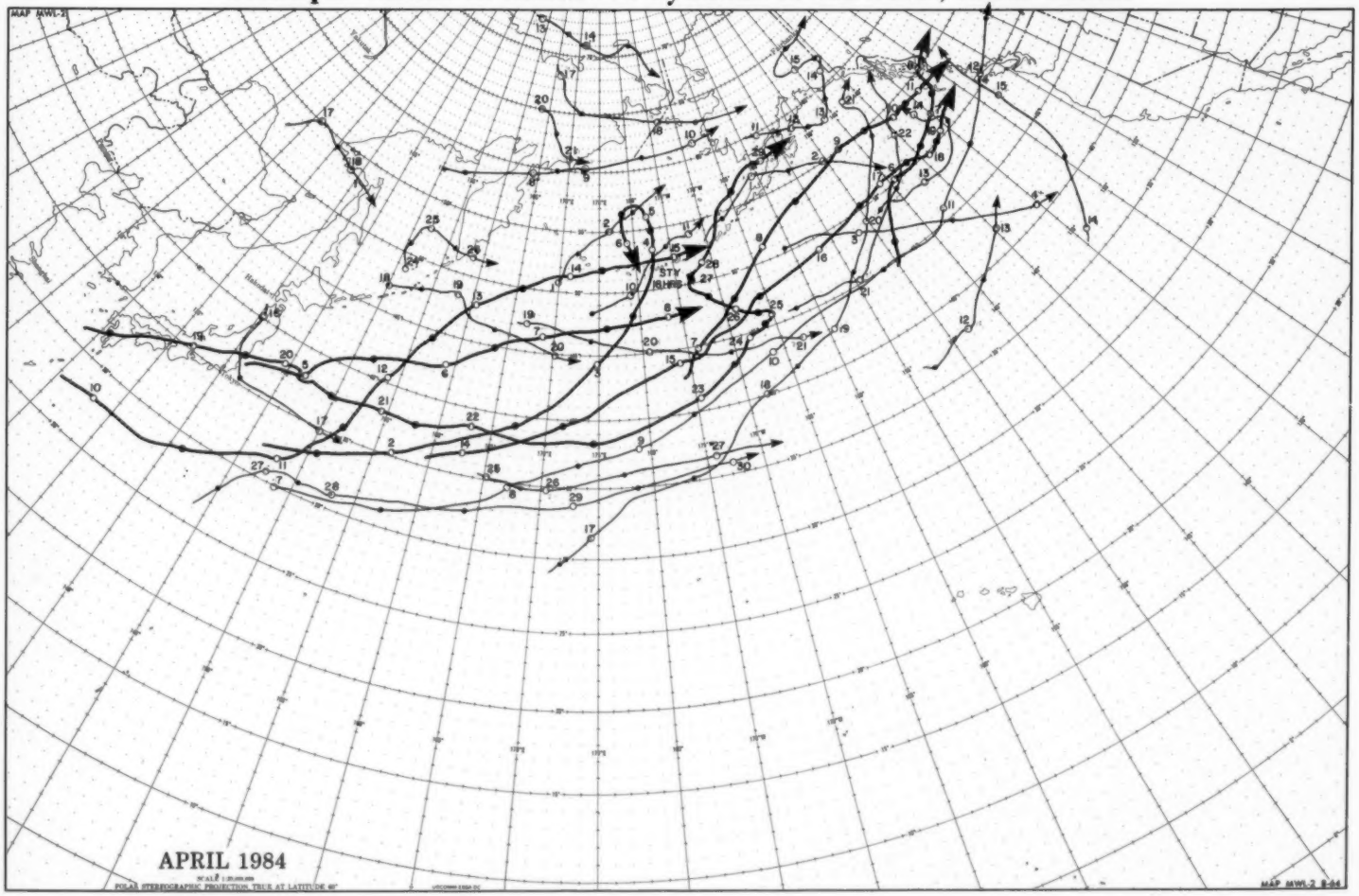
Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

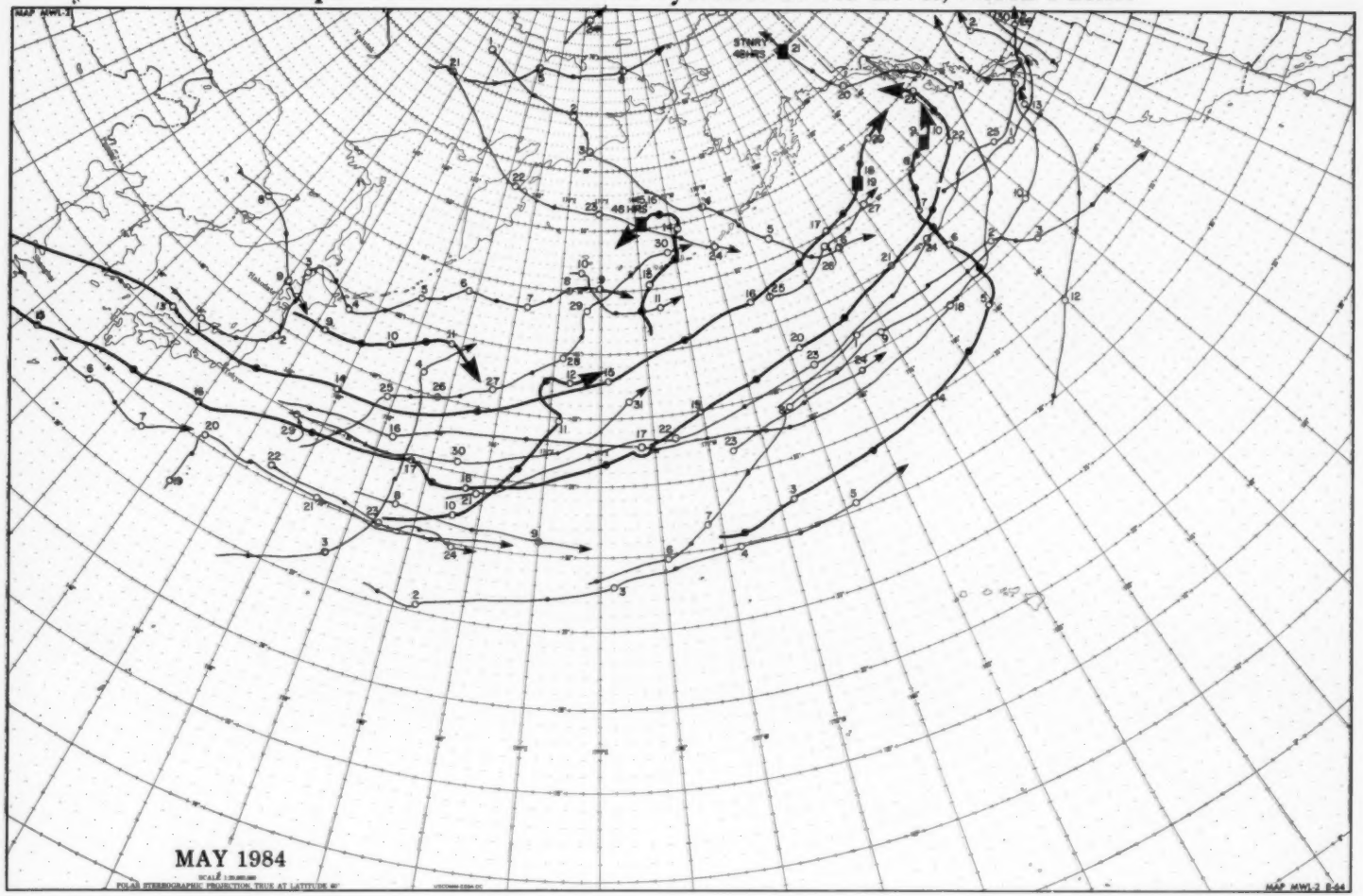
heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

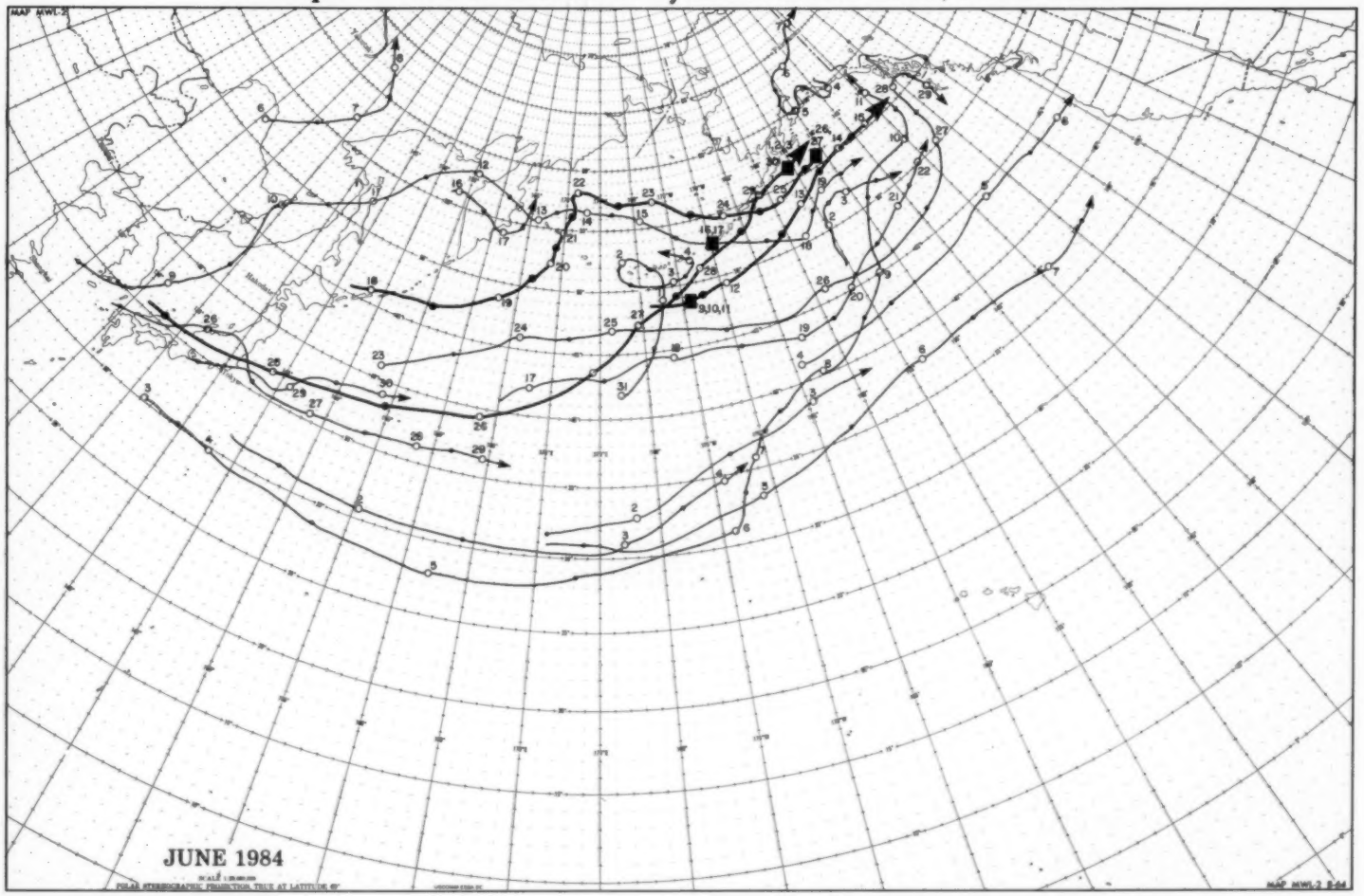
Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

North Atlantic Selected Gale and Wave Observations

April, May and June 1984

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10s	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10s	Swell Waves Period sec.*	Swell Waves Height ft.
	ATLANTIC	APR.															
HOEGH TRIGGER	LCHX	3	45.0 N	36.9 W	00	27	M 46	5 NM	25	1011.0	10.4						
AMERICAN PURITAN	KRGB	4	48.4 N	14.7 W	12	32	35	5 NM	80	1006.4	14.4	8.9	7	16.5	29	12	29.5
TFL FREEDOM	9VXX	5	37.2 N	73.1 W	12	15	M 47	.25 NM	92	1000.5	19.0	24.0	7	23			
	6ZRT	5	47.8 N	18.8 W	18	07	16	10 NM		1016.5	12.0	10.0	5	6.5	03	51	32.5
TFL EXPRESS	9VPU	5	49.6 N	38.6 W	18	28	M 55	10 NM	89	1010.4	6.0	10.0	7	8	28	8	10
TFL EXPRESS	9VPU	6	48.9 N	42.0 W	06	29	M 50	10 NM	58	1025.0	5.0	10.0	8	11.5			
DOLLY TURMAN	WLOD	6	41.2 N	40.9 W	06	33	45	5 NM	88	1024.7	9.4	15.0					
TFL ENTERPRISE	9VVD	6	40.5 N	71.7 W	12	32	M 52	.5 NM	64	1004.0	13.0	15.3	12	16.5	33	10	19.5
HOEGH TRIGGER	LCHX	6	40.5 N	65.7 W	12	15	M 50	2 NM		1008.0	19.0						
SEALAND PIONEER	WSVB	6	37.0 N	36.1 W	12	32	M 47	10 NM	82	1019.0	13.0	16.0	10	24.5	32	11	24.5
TFL DEMOCRACY	9VPR	6	44.4 N	32.6 W	18	34	55	5 NM	81	1006.5	12.0	13.5	9	29.5	34	12	29.5
T F L INDEPENDENCE	9VVK	6	39.0 N	61.8 W	18	14	M 52	2 NM	07	1008.0	19.0	20.0	8	26	15	10	26
AMERICAN PURITAN	KRGB	6	47.0 N	35.5 W	18	35	40	5 NM	25	1013.5	8.9	13.3	8	19.5	35	12	29.5
TFL DEMOCRACY	9VPR	7	44.3 N	34.0 W	00	32	50	5 NM	80	1015.0	10.0	13.2					
TFL ENTERPRISE	9VVD	7	40.0 N	34.9 W	00	33	M 50	2 NM	64	1018.0	13.0						
AMERICAN PURITAN	KRGB	7	46.1 N	37.0 W	00	35	45	5 NM	25	1021.2	6.7	12.8	9	24.5	35	12	29.5
NORTHWIND WAGB 282	NRFJ	11	59.3 N	32.5 W	12	23	M 47	5 NM	07	1004.0	3.5	5.0	5	5	26	7	6.5
ALBATROSS IV	WMVF	22	43.2 N	66.8 W	00	34	M 45	1 NM	22	1006.8	1.2		5	14.5			
CHESAPEAKE	KNFE	22	22.2 N	67.2 W	06	12	51	10 NM	01	1011.5	25.0	26.7					
AMERICAN LARK	WZJF	23	25.1 N	74.7 W	06	14	10	10 NM	01	1017.0	23.9	24.4	4	3	15	0	36
EXPORT CHAMPION	WLCG	23	38.1 N	40.2 W	17	25	45	5 NM	15	0995.0	16.7	13.3	6	11.5	25	7	16.5
TFL FREEDOM	9VXX	24	43.0 N	43.9 W	00	28	M 50	2 NM		0993.2	8.5	17.0					
	NPTF	25	29.0 N	45.7 W	06	27	57	10 NM	01	1022.2	19.0	21.0	8	14.5	29	8	14.5
AMERICAN SUN	WMPR	26	36.8 N	68.8 W	06	32	45	5 NM	02	1004.4	16.2	19.5	4	8	30	8	14.5
	GR. LAKES	APR.															
M/V BURNS HARBOR	WZ37049	17	47.5 N	87.4 W	06	02	M 56	> 25 NM	02		3.0	2.0	11	6.5			
SENTINEL	WYP8657	30	43.8 N	82.5 W	18	21	M 50	5 NM	02		10.0	5.0	4	6.5			
AGNES FOSS	WY73931	30	43.2 N	87.7 W	18	26	M 50	5 NM	60		3.0	1.0	5	10			
H. LEE WHITE	WZD2465	30	43.2 N	87.5 W	18	27	M 45	5 NM	02		7.0	2.0	4	14.5			
	ATLANTIC	MAY															
USNS POWHATAN TATF 166	NKXR	3	51.9 N	18.5 W	18	33	M 30			1004.3	10.0	11.1	3	8	32	7	19.5
HOEGH TRIGGER	LCHX	4	44.2 N	46.2 W	06	25	M 41	10 NM	00	1012.0	5.2						
WALTER RICE	KCSE	4	48.1 N	14.5 W	12	33	30	> 25 NM	01	1007.3	12.2	13.3	5	10	32	10	19.5
FORTALEZA	WEWW	5	33.6 N	73.5 W	00	25	40	2 NM	05	1006.0	25.0	20.0	7	11.5	21	10	19.5
TFL FREEDOM	9VXX	6	39.9 N	59.0 W	00	28	M 40	5 NM		1010.0	17.5	18.2					
EXPORT FREEDOM	WCJS	6	42.7 N	62.9 W	00	27	45	5 NM	01	1004.5	5.6	10.6	12	19.5	27	12	19.5
TFL DEMOCRACY	9VPR	6	44.7 N	59.0 W	06	30	40	10 NM	02	0997.5	5.0	5.0					
HOEGH TRIGGER	LCHX	6	41.5 N	62.5 W	12	30	M 47	5 NM	02	1012.0	9.0	13.6	XX	13			
SEALAND PIONEER	WSVB	6	40.0 N	56.5 W	18	28	M 45	10 NM	01	1011.0	16.5	17.0	7	16.5	27	8	21
AMERICAN PURITAN	KRGB	7	40.5 N	55.9 W	00	28	40	10 NM	25	1010.0	12.2	15.6	3	16.5	27	6	19.5
SEALAND PIONEER	WSVB	7	40.1 N	58.3 W	00	28	M 35	5 NM	02	1016.0	12.0	15.0	8	19.5	28	9	23
TFL ENTERPRISE	9VVD	7	40.5 N	52.9 W	12	28	M 41	10 NM		1011.5	14.0	14.5	6	26			
SEALAND VENTURE	KLJH	7	40.2 N	49.5 W	12	28	28	> 25 NM	02	1011.8	13.3	14.4	5	5	28	9	21
TFL FREEDOM	9VXX	7	42.2 N	43.0 W	18	27	M 23	5 NM	50	1007.5	15.5	18.0	6	10	27	8	19.5
AMERICAN LYNX	WZJE	9	15.6 N	95.0 W	06	01	40	10 NM	02	1013.0	27.2	27.8	4	10			
SEALAND PIONEER	WSVB	16	38.7 N	61.4 W	00	18	M 40	1 NM	18	1007.0	19.0	17.0	4	10	18	6	3
TFL EXPRESS	9VPU	16	48.4 N	26.3 W	12	33	M 40	10 NM	03	1023.0		16.0	8	6.5	30	10	8
	LDEF	16	47.0 N	19.7 W	18	35	M 43	5 NM	02	1019.0	12.0	12.0	5	14.5	30	9	19.5
SEALAND ADVENTUREP	KSLJ	17	37.5 N	15.3 W	06	33	M 37	10 NM	25	1011.5	15.0	16.0	9	19.5	33	9	19.5
TFL DEMOCRACY	9VPR	17	39.8 N	63.8 W	18	07	40	10 NM	02	1008.5	14.0	17.0	6	8	07	7	10
SAINT LOUIS	KMHF	17	36.7 N	72.8 W	18	36	45	10 NM	02	1018.3	15.0	22.6	8	6.5	02	8	8
	OZNA	17	40.5 N	25.0 W	18	33	18	5 NM		1028.0		16.0	6	16.5	36	8	23
	NAMR	17	34.2 N	75.5 W	23	03	40	10 NM	01	1022.0	15.0		3	8	04	8	19.5
LOUISE LYKES	WLCV	18	37.1 N	63.2 W	00	20	45	5 NM	02	1016.2	17.8	17.8	4	6.5	24	4	11.5
	OZNA	18	39.7 N	20.6 W	06	33	20	5 NM		1022.0	15.5	16.0	5	13	35	7	19.5
TFL DEMOCRACY	9VPR	18	40.2 N	59.1 W	12	17	19	5 NM		1005.0	17.5	17.0	2	3	15	10	19.5
	KONB	18	34.1 N	59.5 W	18	22	47	10 NM	01	1010.2	20.5	18.9	3	6.5	22	6	14.5
EXPORT CHALLENGER	WLSG	19	17.6 N	19.7 W	12	02	30	10 NM	02	1015.0	21.1	23.3	2	8	01	6	19.5
	LDEF	19	42.7 N	50.0 W	18	14	M 32	2 NM	10	1020.0	12.5	17.0	5	10	15	11	19.5
LASH PACIFICO	WIEE	19	39.5 N	52.7 W	18	17	30	5 NM	02	1012.5	15.6	18.3	7	14.5	18	8	19.5
	LDEF	20	43.0 N	52.4 W	00	18	M 34	2 NM	10	1012.0	16.0	17.0	6	11.5	15	XX	19.5
TFL FREEDOM	9VXX	21	44.3 N	38.7 W	18	19	M 28	10 NM	00	1029.5	19.5	17.5	4	5	04	11	24.5
TFL EXPRESS	9VPU	28	47.5 N	42.6 W	06	23	M 44	10 NM	02	1020.0	13.0	15.5					
AMCO VOYAGER	KADP	30	47.1 N	26.9 W	18	30	42	2 NM	16	1009.0	12.2	19.4	6	10	30	11	23
TFL DEMOCRACY	9VPR	31	50.6 N	17.3 W	12	29	45	5 NM		0992.5	11.5	13.5	6	10	27	14	16.5
SEALAND INDEPENDENCE	WGJC	31	44.9 N	30.5 W	12	30	M 36	5 NM	25	1021.2	19.0	11.0	10	10	32	18	19.5
MAERSK TRITON	OSWM	31	49.6 N	15.2 W	18	24	36	5 NM	89	0999.0	9.9	12.5	10	19.5	26	11	24.5
AMCO VOYAGER	KADP	31	44.2 N	31.5 W	18	28	35	10 NM	07	1022.0	16.1	18.9	6	10	31	10	23
	GR. LAKES	MAY															
M/V MYRON C. TAYLOR	WA8463	1	43.1 N	82.4 W	00	26	M 40	10 NM			7.0	1.0	4	5			
SENTINEL	WYP8657	1	44.8 N	83.0 W	00	25	M 40	5 NM	02		3.0	3.0	3	8			
H. LEE WHITE	WZD2465	1	41.5 N	87.3 W	00	25	M 42	10 NM	02		- 5.0	3.0	3	6.5			
BENSON FORD	WE8451	8	47.2 N	86.7 W	12	26	M 42	5 NM	02		2.0	2.0	8	8			
LEWIS WILSON FOY	WX53221	9	47.5 N	90.9 W	06	33	M 40	> 25 NM			4.0	2.0	3	5			
J.A.W. IGLEHART	WB6601	14	41.4 N	82.0 W	06	25	M 20	10 NM	01		- 5.0	3.0	21	19.5			
J.A.W. IGLEHART	WB6601	15	43.0 N	82.2 W	06	31	M 20	10 NM	03		- 3.0	2.0	12	19.5			

Continued on page 259.

North Pacific Selected Gale and Wave Observations

April, May and June 1984

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves? Period sec.	Sea Waves? Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	PACIFIC	APR.															
	WGJF	1	45.8 N	161.7 W	06	26	M 34	10 NM	00	1015.0	7.0	5.0	8	19.5	27	10	29.5
PRESIDENT GRANT	WEZO	1	43.9 N	174.5 E	12	20	45	5 NM	81	1008.5	6.7	9.6					
AMERICAN APOLLO	KEOD	2	35.5 N	159.0 E	20	34	47			1000.5	10.0	13.3	5	19.5			
	D7YL	2	32.6 N	162.2 E	23	27	M 52			1003.8	14.8	19.0	11	16.5	25	14	19.5
TARASCO	DXFU	3	34.9 N	161.4 E	00	31	M 53			1005.6	12.0	16.0	15	16.5			
CLARA MAERSK	OWIK	3	47.4 N	154.9 W	12	31	46	2 NM	81	1006.4	4.5						
TROPICALE	ELBM4	3	45.5 N	173.3 E	18	36	M 65	.25 NM	44	0974.0	1.0	5.0	6	16.5			
	WGJF	3	39.7 N	177.1 E	18	27	M 70	5 NM	64	1002.0	9.0	9.0	12	41	27	12	41
SEALAND LIBERATOR	KHPP	4	40.1 N	172.1 E	00	27	M 35	10 NM	01	1012.2	6.0	7.0	8	26	29	13	29.5
	WGJF	4	39.6 N	176.9 E	00	28	M 70	5 NM	14	1010.0	8.0	8.0	12	44	28	12	44
ARCTIC TOKYO	SLJT	4	53.8 N	177.0 W	06	09	M 60	50 YD	75	0968.0	1.0	2.0	11	23			
BUNGA MELAWIS	9MUT	4	49.0 N	175.1 W	18	24	55	2 NM	24	0990.0	0.5	4.5	12	16.5	25	15	34.5
PRESIDENT WILSON	WNPD	4	54.4 N	170.4 W	18	18	45	5 NM	02	0997.3	9.0	9.3	8	16.5	18	10	21
CLARA MAERSK	OWIK	5	43.0 N	167.0 W	00	23	20	10 NM		1021.1	9.0		4	6.5	28	13	29.5
LICA MAERSK	OXPS	5	50.7 N	166.0 W	05	23	52	2 NM	83	1003.2	4.0	2.0	10	21	23	14	28
ARCTIC TOKYO	SLJT	5	54.1 N	168.4 W	06	21	M 43	2 NM	84	0988.0	1.0	5.0	10	29.5			
CRYSTAL STAR	DSTG	5	53.6 N	163.5 W	06	21	M 35			1000.0	3.0	3.0	8	16.5	25	14	29.5
PRESIDENT WILSON	WNPD	5	53.9 N	170.5 W	06	21	48	5 NM	02	0998.5	3.3	3.3	8	16.5	21	10	26
PRESIDENT JEFFERSON	WPGE	6	37.9 N	164.3 E	06	19	48	5 NM		0997.6	12.8	12.8	5	10	19	9	11.5
	WGJF	6	36.8 N	154.8 E	12	29	M 46	10 NM	02	0996.0	13.0	11.0	8	10	29	12	16.5
EXXON NEW ORLEANS	WNDM	6	50.3 N	134.5 W	18	14	M 45	2 NM	63	0994.6	5.5	7.8	6	10	15	9	13
PACIFIC ANGEL	3EXQ2	7	50.2 N	129.5 W	00	16	M 51	200 YD	63	1001.0	7.0		7	19.5	16	8	23
	KACN	7	49.5 N	129.1 W	18	21	32	10 NM	16	0998.8	8.9	8.3	3	8	24	7	29.5
	KRDB	7	50.1 N	134.3 W	18	22	30	5 NM	02	0986.8	9.4	9.0	10	6.5	25	18	29.5
BOGASARI DUA	PLYA	7	29.0 N	174.5 W	18	11	M 66	5 NM	01	1025.3	20.5	21.0					
EXXON NEW ORLEANS	WNDM	7	55.4 N	140.1 W	18	02	M 45	5 NM	82	0989.2	6.8	7.8	6	10	15	9	13
	KRDB	8	49.2 N	132.4 W	00	27	30	5 NM	02	0994.6	8.3	9.0	10	6.5	26	18	29.5
PRESIDENT MC KINLEY	WWFZ	9	33.0 N	167.7 E	00	02	57	2 NM	40	1016.9	12.8	16.1	5	8	02	6	10
PRESIDENT JACKSON	KACB	9	46.5 N	156.3 W	06	30	45	10 NM		1000.5	3.9	5.0	10	16.5	30	15	19.5
CHEVRON CALIFORNIA	WCRN	9	46.5 N	151.6 W	06	27	49	5 NM	82	0993.7	6.1	5.0	3	14.5	27	8	26
MOHSING ARROW	3EME	9	51.1 N	173.3 W	11	18	M 50	1 NM	81	0981.0	6.0	9.0	10	16.5			
CORNUCOPIA	KPJC	9	51.3 N	130.7 W	12	15	55	1 NM	59	0990.0	5.3	8.3	9	19.5	15	9	19.5
PETERSBURG	WJDC	9	44.3 N	128.6 W	12	16	45	2 NM	63	1003.5	8.9	7.8	3	11.5	18	6	16.5
MISSION SANTA CLARA	WKJO	9	47.7 N	173.0 W	12	27	45	5 NM	01	0988.0	7.2	7.8	XX	23			
	WLDU	9	47.4 N	133.5 W	12	24	45	5 NM	60	0988.1	9.4	8.3	5	13	23	7	14.5
PACIFIC ANGEL	3EXQ2	9	53.8 N	154.7 W	18	32	M 70	200 YD	61	0985.0	4.0		14	19.5	32	15	26
	KACN	9	56.7 N	140.9 W	18	11	50	2 NM	54	0973.8	5.0	5.6	3	10	12	6	21
SS B T SAN DIEGO	WSVR	9	44.4 N	128.4 W	18	26	26	10 NM	15	0998.8	8.9	8.3	4	16.5	23	8	32.5
PACIFIC ANGEL	3EXQ2	10	53.8 N	155.5 W	00	32	M 52	.25 NM	18	0996.0	4.0		14	19.5	32	15	26
	3ZUB	10	46.6 N	139.0 W	00	26	M 52	5 NM	03	0992.5	7.0	8.0	9	16.5	27	15	37.5
KOREAN FIR	A8LW	10	48.4 N	149.1 W	00	29	M 50			0997.2	7.0	6.0	3	8	29	9	16.5
	KACN	10	58.1 N	143.1 W	00	09	45	5 NM		0980.8	5.0	5.6	3	11.5	12	6	24.5
MISSION SANTA CLARA	WKJO	10	45.5 N	130.8 W	00	25	34	5 NM	01	0999.0	8.9	9.5	5	11.5	26	8	46
	WLDU	10	46.4 N	131.4 W	00	26	35	5 NM		0996.2	9.4	8.9	5	11.5	25	7	24.5
CHEVRON WASHINGTON	KFDB	10	50.3 N	134.6 W	12	21	M 20	5 NM	25	0988.2	7.8		3	6.5	27	8	29.5
SS B T SAN DIEGO	WSVR	10	46.0 N	130.2 W	18	29	40	5 NM	06	1013.0	7.8	7.8	6	24.5	28	8	32.5
PRESIDENT LINCOLN	KDRG	10	50.5 N	130.2 W	21	18	M 28	10 NM	02	0995.5	8.9	7.8	XX	13	27	8	39
SS B T SAN DIEGO	WSVR	11	46.5 N	130.4 W	00	29	41	2 NM	82	1005.1	6.7	7.2	7	16.5	28	15	36
METEOR T-AKP 9	NBIJ	11	30.1 N	153.8 E	12	14	50	2 NM	63	1002.5	17.8	16.7	2	13	12	8	18
SEALAND DEVELOPER	KHRH	11	35.4 N	156.1 E	18	16	M 47	2 NM	55	1009.8	12.8	13.0					
EASTERN DIAMOND	HOOT	12	39.8 N	153.2 E	12	05	M 45			0987.0	8.0	7.0	15	19.5	05	15	19.5
	D5CW	12	42.9 N	165.0 E	18	14	M 59	1 NM	60	1003.0	6.0	5.0	10	19.5			
ARCTIC TOKYO	SLJT	13	47.8 N	158.8 E	06	07	M 45	1 NM	05	0941.0	2.0	2.0	10	8			
	D5DW	13	45.4 N	169.9 E	18	23	M 45	5 NM	02	1000.0	6.0	5.0	9	16.5			
EXXON NEW ORLEANS	WNDM	13	43.9 N	148.8 W	18	15	M 45	5 NM		1010.0	10.6	13.3	6	10	18	9	16.5
BUNGA MELAWIS	9MUT	14	49.0 N	174.9 W	12	24	M 60	5 NM	07	0985.0	1.5	5.0					
GLACIER BAY	KACF	15	55.7 N	140.8 W	00	31	40	10 NM	02	0999.1	6.0	4.4	5	16.5	13	8	32.5
ALEUTIAN DEVELOPER	WIPL	15	53.1 N	171.7 W	18	08	M 50	5 NM	58	0995.0	4.4	3.8	4	10	08	5	14.5
KEIYO	JHHQ	16	47.3 N	154.3 W	18	27	M 45	.5 NM	07	0985.0	5.5	5.5	XX	23	28	XX	23
LUNA MAERSK	OWDX	17	48.5 N	150.1 W	12	32	25	2 NM	63	0979.8	6.4		8	6.5	26	20	32.5
GREAT LAND	WFDP	18	51.5 N	133.3 W	00	14	50	1 NM	65	0990.0	7.2	1.0	8	26	14	10	29.5
ALEUTIAN DEVELOPER	WIPL	18	56.5 N	155.4 W	00	34	M 46	10 NM	02	1005.2	0.0	1.1	5	14.5	36	10	18
HANJIN KWANGYANG	3EZL2	18	49.6 N	147.0 W	18	32	M 40			0998.0	4.0	1.0	25	29.5	30	15	23
SEALAND ENDURANCE	KGJX	19	44.7 N	167.0 E	06	17	M 45	1 NM		1009.2	2.8	3.0	5	8	16	5	8
PRESIDENT TYLER	WEZM	19	49.5 N	147.4 W	06	32	45	5 NM	02	1009.7	3.3	4.4	8	23	31	12	46
THOMPSON PASS	WSPY	19	43.3 N	129.1 W	17	27	25	10 NM	02	1003.5	16.1	10.6	2	3	27	11	52.5
	LIQL	20	45.0 N	151.2 W	12	25	M 55	1 NM	12	0998.5	4.5						
SS B T SAN DIEGO	WSVR	21	47.5 N	132.6 W	12	24	50	5 NM	15	1015.0	6.7	6.7	4	14.5	21	16	23
THOMPSON PASS	WSPY	21	43.6 N	135.6 W	17	27	45	5 NM	02	1016.0	8.9	7.8	2	5	26	10	41
S.S. MORIL MERIDIAN	KGSM	21	48.8 N	133.4 W	18	27	M 28	10 NM	07	1019.0	10.4	7.2	4	8	25	11	29.5
PRESIDENT MC KINLEY	WWFZ	21	28.4 N	176.7 E	18	36	50	2 NM	52	1013.0	16.7	19.4	5	10	36	7	11.5
SS B T SAN DIEGO	WSVR	22	45.6 N	129.9 W	00	28	24	10 NM	02	1027.9	10.0	7.8	3	16.5	29	8	29.5
PETERSBURG	WJDC	23	51.9 N	135.9 W	00	26	48	10 NM	18	1012.0	5.6	6.1	6	32.5	27	8	41
OVERSEAS CHICAGO	KBCF	23	54.3 N	137.5 W	12	28	45	5 NM	01	1018.0	3.3		XX	13			
EXXON PHILADELPHIA	WNFJ	23	39.2 N	124.2 W	18	33	M 45			1019.5	15.0	12.2	5	8	34	7	8
DRAGOR MAERSK	OYYZ	23	44.1 N	173.0 W	21	03	52	1 NM	85	1013.5	3.6		8	23			
DRAGOR MAERSK	OYYZ	24	43.2 N	172.0 W	00	04	70				5.5		8	23			
SEA FAN	ELCG9	24	45.7 N	154.2 E	05	11	M 43	200 YD	84	1009.0	1.0	3.0	10	32.5	11	8	29.5
LEDA MAERSK	OULU	24	41.6 N	168.7 W	06	20	45			0985.0	7.0	1.0	6	23			
CHARLOTTE MAERSK	OYIU	24	45.8 N	171.5 W	06	02	45	200 YD	75	1010.0	2.0		12	26			
SS B T SAN DIEGO	WSVR	24	34.9 N	121.8 W	06	33	49	5 NM	07	1012.5	10.6	11.7	4	19.5	32	8	26
BUNGA MELAWIS	9MUT	24	44.5 N	161.6 E	12	15	50	5 NM	02	1023.0	3.0	7.5	12	19.5	14	15	29.5
	8WFK	24	39.7 N	173.3 W	12	31	M 45	1 NM	63	1007.0	6.0						
MANUKAI	KNLO	24	36.5 N	126.8 W	18	36	M 45	10 NM	02	1024.0	10.6	12.8	4	11.5	36	8	19.5
	3ESG2	25	39.7 N	157.2 W	00	18	M 45	.5 NM	50	1006.0	15.5		2	19.5	16	9	18
MANUKAI	KNLO	25	37.1 N	125.1 W	00	36	M 49	10 NM	01	1022.0	11.1	12.2	4	13	36	8	21
SS B T SAN DIEGO	WSVR	25	31.6 N	118.9 W	00	30	31	5 NM	02	1010.0	14.4	12.8	5	19.5	32	10	29.5
TROPICALE	ELBM4	25	43.1 N	175.2 W	06	34	45			1011.0	4.0	7.0	7	10	34	12	19.5
USNS SEALIFT PACIFIC	NENC	25	32.5 N	121.4 W	22	34	42	10 NM	02	1019.3	13.9	12.8	9	13	33	13	36
USNS SEALIFT PACIFIC	NENC	26	32.2 N	121.4 W	00	34	42	10 NM	02	1019.3	13.3	12.8	9	13	33	13	36
B T ALASKA	WFOE	26	35.3 N	121.7 W	06	33	48	10 NM	02	1015.4	10.0	10.6	5	10	33	6	14.5

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C		Sea Waves?		Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.°	Height ft.
	PACIFIC	MAY															
SEALAND ENDURANCE	KGJX	1	54.2 N	169.8 W	00	34	M 37	5 NM	20	1005.5	3.3	4.0	5	6.5	34	6	23
KENWOOD	H3SG	3	48.3 N	168.3 W	00	30	M 12	10 NM	02	1002.0	7.0	6.0	10	13	20	10	26
KENWOOD	H3SG	4	48.3 N	158.3 W	06	32	M 14	5 NM	03	1020.0	4.0		12	23	32	12	16.5
	3EWQ	5	39.2 N	147.8 W	06	06	M 40	2 NM	54	1015.0	10.0	12.0	5	5	07	8	8
	WGJE	5	42.6 N	145.0 W	18	09	M 27	10 NM	02	1018.5	13.0	7.0	9	16.5	09	10	19.5
KENWOOD	H3SG	6	47.9 N	138.8 W	18	10	M 40	5 NM	03	1012.0	9.6		8	19.5	09	7	21
PACIFIC SUNSHINE	D9DR	6	48.9 N	160.8 W	22	01	M 22	10 NM	02	1020.0	8.5	4.0	10	19.5	01	10	8
	3FGE2	6	50.0 N	143.0 W	23	08	M 41	.25 NM	24	1004.5	6.0	6.0	6	8	11	7	10
PACDUCHESS	ABVI	7	48.3 N	159.3 E	00	27	M 30			1014.5	5.8	- 2.0	XX	19.5	29	6	19.5
OLGA TOPIC	ABEE	7	51.1 N	140.3 W	06	11	47			1003.2	9.0	8.0	9	16.5			
KENWOOD	H3SG	7	48.1 N	137.4 W	06	14	M 49	.5 NM	60	0996.0	9.0		16	24.5	15	15	24.5
	3FGE2	7	50.2 N	142.4 W	11	09	M 54	.25 NM	20	0985.0	7.0	7.1	9	24.5	11	9	24.5
ATIGUN PASS	KSFJ	7	51.4 N	136.5 W	12	14	42	5 NM		1005.5	8.7	7.8	5	14.5			
AMERICA SUN	WNEJ	7	49.9 N	134.4 W	12	12	M 48	2 NM	25	1010.1	6.7	8.3	6	11.5	17	10	16.5
MOHSING BREEZE	3EOU	7	50.9 N	134.9 W	18	11	M 30	.25 NM	62	1000.5	9.0	9.0	12	19.5	11	12	18
SEA BELLS	ELCN7	7	49.5 N	149.1 W	18	02	M 45	2 NM	81	0985.5	6.0	8.0	10	10	02	10	10
B T ALASKA	WFOE	7	43.6 N	128.6 W	18	15	40	5 NM	25	1015.0	12.2	10.6	5	10	13	8	11.5
PACIFIC SUNSHINE	D9DR	7	46.3 N	151.6 W	21	32	M 35			1001.0	9.0	5.0	15	26	32	15	26
MOHSING BREEZE	3EOU	8	50.5 N	133.5 W	00	14	M 25	5 NM	03	1004.5	10.0	9.5	12	19.5	14	12	18
QUINTINA	D5FU	8	50.2 N	147.1 W	00	09	M 40	1 NM	14	0985.5	12.1	1.2	5	11.5	09	7	11.5
S.S. MOBIL MERIDIAN	KGSM	8	54.6 N	136.5 W	00	10	42	2 NM	63	1005.5	8.8	7.8	6	6.5	10	9	19.5
ARCO TEXAS	KNFD	8	55.8 N	140.5 W	00	09	M 29	5 NM	02	1004.8	7.2	6.7	6	10	14	8	19.5
	KRDB	8	54.2 N	139.1 W	00	12	32	5 NM	01	1000.3	8.9	7.0	7	11.5	15	12	19.5
KENWOOD	H3SG	8	47.3 N	132.1 W	06	18	M 30	5 NM	03	1007.0	9.0		13	18	18	13	19.5
HOTAKA MARU	JCZF	8	43.6 N	145.5 W	06	26	M 43	5 NM		1006.8	7.5	6.5	8	6.5	27	8	18
SKOUBORD	LIQN	8	43.8 N	145.1 W	06	27	40			1004.0	8.0	8.5	7	13	31	7	13
PRESIDENT PIERCE	WUBV	8	42.6 N	148.3 W	06	27	40	10 NM	02	1013.0	7.8	5.6	5	16.5	34	XX	14.5
	3FGE2	8	49.8 N	139.1 W	11	17	M 32	2 NM	25	0987.0	7.0	7.9	9	24.5	11	10	18
PRESIDENT LINCOLN	KDBG	8	49.6 N	176.0 W	12	11	M 40			1011.0	6.1	3.3	XX	8	13	7	21
TONSONIA	KJDG	8	45.5 N	130.4 W	18	21	15	10 NM		1017.1	10.6	11.1	6	6.5	27	6	19.5
PACIFIC SUNSHINE	D9DR	8	43.0 N	142.5 W	20	27	M 28	5 NM	33	1015.0	12.0	9.0	10	24.5	27	10	24.5
	3EUB	9	49.9 N	162.0 W	00	34	M 19	5 NM	03	1019.0	7.0	4.0	4	5	10	10	21
CORNUCOPIA	KPJC	9	46.4 N	128.6 W	00	20	20	10 NM		1016.9	11.4	10.0	6	8	28	11	19.5
	KRDB	9	51.6 N	136.2 W	00	32	30	2 NM	15	0991.0	10.0	9.0	6	8	19	8	24.5
PACIFIC ANGEL	3EXQ2	9	46.7 N	131.3 W	12	23	M 40			1010.0	10.0		6	11.5	26	9	16.5
PRESIDENT LINCOLN	KDBG	9	51.0 N	163.0 W	12	34	M 15	10 NM	00	1018.5	5.6	4.5			04	7	21
	SKXZ	9	34.2 N	140.2 E	12	18	M 12	10 NM		1025.5	16.5		3	5	31	10	19.5
	3EGC2	10	14.4 N	94.8 W	00	01	M 40	5 NM	02	1010.2	28.5	30.0	6	8	02	10	13
	HPET	10	46.8 N	169.7 W	00	09	M 09	10 NM		1019.0	7.5	5.0	6	6.5	10	9	24.5
SEALAND DEVELOPER	KHPH	10	41.6 N	127.1 W	06	27	M 10	10 NM		1021.9	11.5	13.0	3	8	27	8	19.5
CORNUCOPIA	KPJC	10	52.3 N	135.5 W	06	16	21	5 NM		1005.0	6.4	8.9	4	6.5	21	9	19.5
AMERICAN TITAN AK 1008	KPHB	10	14.5 N	94.2 W	18	34	30	10 NM	05	1011.2	27.8	27.8	4	10	34	5	19.5
	OXFY	11	36.3 N	162.0 E	18	27	M 47	10 NM	81	1008.5	14.0	17.5	7	14.5			
B T ALASKA	WFOE	11	25.2 N	113.7 W	18	31	M 14	5 NM	05	1014.0	18.9	17.2	6	3	31	12	32.5
PRINCE OF TOKYO	ABGJ	12	44.9 N	179.0 W	00	11	M 40	700 YD		1010.2	8.0	8.0	3	10	12	3	8
PACIFIC ANGEL	KGJF	12	38.3 N	170.2 E	12	27	M 40	5 NM	58	1000.0	8.0	13.0	5	6.5	27	6	10
SEALAND DEVELOPER	3EXQ2	13	53.9 N	171.5 W	12	10	M 32	2 NM	51	0988.5	6.0		7	14.5	10	8	19.5
HOEGH MIRANDA	XHPH	13	54.3 N	167.7 W	18	14	M 30	10 NM	02		6.0	5.0	6	16.5	13	10	19.5
HOEGH MIRANDA	LIQZ	13	45.1 N	178.4 W	18	27	M 40	10 NM	25	0991.5	5.5						
	LIQZ	14	45.3 N	176.2 W	00	24	M 40	5 NM	40	0995.5	7.5						
GREEN MAYA	JERV	14	39.3 N	148.7 E	12	05	M 40	2 NM	50	1006.0	9.0	11.0					
CLOVER C6C	NRPK	15	38.3 N	123.3 W	06	32	M 35	5 NM		1013.0	12.2	8.3	5	10	32	7	31
	3ELX	15	38.9 N	179.4 W	18	22	M 40	50 YD	45	1004.5	15.0	14.0	8	13	22	14	16.5
CHARLOTTE MAERSK	OYIU	16	44.7 N	168.0 W	18	27	50	2 NM	41	0994.0	4.0		16	36			
	WDZB	16	22.6 N	122.5 E	18	02	M 18	5 NM	11	1011.0	25.0	26.7	XX	6.5	17	24	34.5
LOUIS MAERSK	OXMA	17	50.6 N	167.5 W	00	08	M 40	2 NM	60	0991.8	5.0	2.0	5	16.5	18	8	23
CHARLOTTE MAERSK	OYIU	17	44.7 N	165.8 W	00	28	45	2 NM		0996.0	6.0		14	36			
ALEUTIAN DEVELOPER	WIPL	17	56.5 N	155.6 W	06	10	M 44	1 NM	20	0991.5	6.7	5.0	5	10	09	9	14.5
FAIRWEATHER	WTEB	18	57.4 N	156.2 W	00	06	M 40	5 NM	02	0995.3	8.3	6.1	2	5			
GLACIER BAY	KACF	19	47.8 N	132.9 W	06	21	42	.25 NM	62	0995.0	10.0	7.2	4	16.5	22	6	19.5
CHEVRON OREGON	WNML	19	51.6 N	136.1 W	06	14	M 12	5 NM		1001.0	9.4		2	1.5	26	9	19.5
SEA BELLS	ELCN7	19	50.7 N	132.3 W	18	24	M 55	2 NM	81	0996.0	10.0	12.0	10	11.5	24	10	11.5
CRYSTAL STAR	D5TG	21	43.1 N	147.3 W	18	26	M 54	200 YD		0997.0	9.0	8.0	5	8	26	10	14.5
EVER LOADING	3EWM2	21	41.8 N	153.8 W	21	27	M 50	10 NM		1019.3	15.0	11.0	6	10	08	11	11.5
	D5AL	22	42.5 N	143.9 W	00	27	M 49	2 NM		1005.0	10.5	9.5	4	13	26	7	19.5
CRYSTAL STAR	D5TG	22	43.5 N	145.4 W	00	24	M 58	.25 NM	43	1003.0	10.0	8.0	10	13	29	11	16.5
	HPET	22	45.6 N	142.1 W	06	31	M 40	1 NM		0985.0	8.0	9.0					
SS B T SAN DIEGO	WSVR	22	46.2 N	130.9 W	06	18	42	2 NM	07	1000.0	10.0	8.9	14	16.5	17	18	19.5
BOGASARI DUA	PLYA	22	45.3 N	133.7 W	12	22	M 48	.5 NM	24	1000.5	11.0	10.0					
PRESIDENT LINCOLN	KDBG	22	49.9 N	129.2 W	18	20	M 40	5 NM	11	0997.2	10.0	10.1	6	13	20	10	14.5
GREAT LAND	WFDP	22	53.1 N	134.9 W	18	07	M 45	5 NM		0987.0	10.0	10.0	4	11.5	14	6	14.5
SS B T SAN DIEGO	WSVR	23	43.0 N	128.0 W	06	33	30	10 NM	02	1019.0	9.4	9.4	3	10	25	14	19.5
S.S. MOBIL MERIDIAN	KGSM	23	49.5 N	127.4 W	12	21	30	10 NM	81	1011.2	10.0	8.9	5	8	21	12	19.5
THOMPSON PASS	WSPY	23	49.0 N	126.9 W	17	27	30	10 NM	01	1017.5	15.0	10.6	10	24.5	27	11	24.5
KENWOOD	H3SG	24	52.7 N	170.6 E	00	36	M 25	.5 NM	45	1012.0	6.0	4.0	10	31	27	10	14.5
SURVEYOR	WTES	24	39.9 N	124.3 W	00	32	M 40	10 NM	02	1022.0	12.8	13.3	8	6.5	32	9	16.5
SKOUBORD	LIQN	24	52.1 N	138.2 W	06	27	30	5 NM	03	1016.0	9.0	9.0	5	19.5	24	5	19.5
AMERICA SUN	WNEJ	24	39.6 N	125.0 W	12	34	M 40	10 NM	02	1021.0	11.0	8.0	8	19.5	34	12	26
METEOR T-AKP 9	NBIJ	25	33.5 N	123.7 W	18	36	M 38	5 NM	03	1017.0	15.0	15.6	2	10	36	10	19.5
METEOR T-AKP 9	NBIJ	26	34.2 N	121.5 W	00	36	M 38	5 NM	01	1013.0	14.4	12.8	2	10	36	10	19.5
OCTA	ABDB	26	47.5 N	127.7 W	06	35	M 34	< 50 YD		1009.5	10.0	8.0	3	19.5	36	4	19.5
AMERICAN AQUARIUS	WYBI	27	37.4 N	123.9 W	06	31	35	10 NM	02	1010.4	17.8	18.9	2	19.5	31	4	19.5
	WLGF	28	40.6 N	124.7 W	12	36	20	5 NM	02	1010.0	12.8	11.7	3	5	36	6	19.5
CORNUCOPIA	KPJC	31	47.0 N	131.7 W	00	30	27	10 NM	03	1026.4	10.0	9.4	6	10	25	9	19.5
EXXON NEW ORLEANS	WNDM	31	38.5 N	124.4 W	00	30	M 50	5 NM	00	1013.8	13.0	12.0	9	16.5	33	10	16.5
	HPOP	31	34.9 N	124.7 W	06	36	M 40	5 NM	01	1017.2	12.0	15.0	6	13	36	6	13

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves+ Period sec.	Sea Waves+ Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	PACIFIC	JUNE															
AXEL JOHNSON	SMFN	1	14.7 N	94.8 W	00	02	37	2 NM		1009.8	27.2	28.7	10	23			
SS B T SAN DIEGO	WSVR	1	14.6 N	95.6 W	00	04	40	5 NM	07	1008.5	26.7	28.9	10	19.5	04	5	19.5
CHEVRON OREGON	WNRL	1	39.6 N	124.6 W	06	34	M 45	5 NM		1017.2	11.7		6	14.5	34	9	23
THOMPSON PASS	WSFY	1	39.2 N	125.6 W	17	36	35	5 NM	05	1020.0	13.9	12.2	13	24.5	36	13	24.5
CHEVRON OREGON	WNRL	2	42.3 N	125.0 W	06	35	M 40	5 NM		1020.8	11.7		7	13	35	10	19.5
TONSONIA	WJDS	2	39.8 N	125.2 W	18	34	M 40	10 NM		1020.0	13.9	13.3	5	14.5	34	5	18
	WDNF	6	42.3 N	133.6 W	06	32	M 30	1 NM	50	1001.0	11.0	10.0	7	19.5	31	8	18
HOEGH MIRANDA	LICZ	6	37.1 N	154.7 E	12	02	M 50	10 NM	02	1023.3	15.0						
USNS NODAWAY (T-AOG78)	NIRX	6	34.7 N	128.2 E	18	18	40	2 NM	67	1006.0	20.6	16.7	3	19.5			
ADRIAN MAERSK	OYIT	7	37.5 N	128.3 W	00	32	28	10 NM	02	1017.0	16.0	13.0	6	11.5	31	13	26
EASTERN DIAMOND	WDMY	12	49.9 N	176.0 E	00	36	M 15	5 NM		1018.0	8.0	7.0	14	19.5	36	14	19.5
WESTWARD VENTURE	KHJB	13	56.5 N	142.8 W	00	15	M 19	2 NM	41	1007.2	9.2	10.0	3	13	16	6	28
	SLOT	13	53.5 N	176.3 E	05	08	M 40			0993.0	3.5	4.0	4	6.5	07	8	11.5
SS B T SAN DIEGO	WSVR	14	39.9 N	124.6 W	00	34	M 40			1010.4	14.4	12.2	6	10	34	12	13
ATIGUN PASS	WSFJ	14	39.0 N	124.6 W	12	34	25	10 NM	10	1013.2	12.8	13.3	4	6.5	33	15	26
OVERSEAS JUNEAU	WWND	15	39.4 N	124.7 W	00	32	35	2 NM		1009.0	20.0	10.0	5	19.5	33	10	32.5
GALLEON PRIDE	DZPK	17	36.0 N	127.0 W	06	30	M 29	10 NM	02	1022.0	14.0	14.0	6	19.5	31	8	19.5
	JMGK	18	36.7 N	128.0 W	18	33	M 28	10 NM	03	1020.0	15.0	14.0	6	11.5	34	12	19.5
SEA DIAMOND	3FJR2	19	36.5 N	132.2 E	00	22	19	10 NM	02	1011.0	24.0	25.0	4	5	04	4	19.5
BUNGA MELAWIS	9MUT	20	38.9 N	145.3 E	03	29	30	1 NM		0997.5	16.0	16.0	12	19.5	30	15	23
	S6FA	22	47.7 N	168.6 E	12	25	M 43	5 NM	07	1011.0	8.0	7.0					
LAURA MAERSK	OYBF	22	50.1 N	171.1 E	14	25	40	.5 NM	44	1002.5	7.6		8	19.5	22	8	16.5
PRESIDENT WASHINGTON	WHRN	22	52.5 N	178.0 E	18	23	33	2 NM	12	0991.5	6.1	6.1	8	19.5	21	10	21
PRESIDENT WASHINGTON	WHRN	23	52.9 N	175.2 E	00	28	42	5 NM	07	0988.0	6.7	3.9	8	13	23	14	26
	ELDT5	23	51.3 N	174.3 W	12	23	M 41	1 NM		1000.0	7.9	8.0	6	8	23	7	10
NEWARK	WNCO	27	58.7 N	150.0 W	00	05	M 28			0991.5	12.2	12.8	3	8	04	9	19.5
SEALAND ENDURANCE	KGJX	27	49.1 N	179.2 W	12	12	M 41	5 NM		0997.6	10.0	6.0	5	6.5	23	6	14.5
SEA LIGHT	ELDE9	27	44.8 N	178.6 E	18	23	M 46	.5 NM	04	0991.5	7.5	8.0	12	16.5	23	12	18
MISSION SANTA CLARA	WKJO	27	54.3 N	137.1 W	18	07	45	2 NM		0984.5	10.0	11.2	7	14.5	09	9	16.5
	KACN	28	49.0 N	134.2 W	00	23	40	10 NM	18	1004.2	11.5	10.0	4	11.5	22	5	16.5
SEA LIGHT	ELDE9	28	45.9 N	177.2 W	06	24	M 42	.5 NM	04	0997.5	8.5	9.5	10	16.5	24	12	18
MISSION SANTA CLARA	WKJO	28	52.9 N	135.5 W	06	20	42	5 NM	02	0994.0	10.6	11.1	7	16.5	19	8	16.5
CHARLES LYKES	KLHR	30	33.4 N	120.7 W	00	32	45	5 NM		1012.1	16.7	11.6	3	8	32	6	16.5

+ Direction of sea waves same as wind
I Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

Continued from page 256.

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves+ Period sec.	Sea Waves+ Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	ATLANTIC	JUNE															
SEALAND INDEPENDENCE	WGJC	1	46.0 N	25.4 W	00	30	M 33	5 NM	81	1013.3	11.0	11.0	7	14.5	33	12	26
MAERSK TRITON	D5WM	1	49.0 N	17.2 W	06	30	24	5 NM	81	0997.2	8.3		7	14.5	31	9	19.5
EXPORT PATRIOT	WCJY	2	36.3 N	22.3 W	12	30	20	10 NM	02	1022.5	16.1	17.6	3	6.5	30	10	19.5
DISCOVERER SEVEN SEAS	3ELE	2	38.6 N	72.8 W	18	30	M 40	2 NM	66	1001.5	13.9	15.0	5	8	31	7	10
TFL FREEDOM	9VXX	2	38.9 N	67.1 W	18	24	M 30	5 NM	02	0997.5	17.5	22.3	6	11.5	24	8	19.5
TFL DEMOCRACY	9VPR	3	49.4 N	36.0 W	00	28	45	2 NM	07	1008.5	13.0	13.5					
TFL FREEDOM	9VXX	3	39.1 N	60.4 W	12	19	M 28	5 NM	25	0993.0	23.0	24.0	7	11.5	19	8	19.5
AMCO VOYAGER	KADP	3	40.6 N	52.0 W	12	17	35	2 NM	63	1004.5	19.4	23.3	6	16.5	17	7	23
DEFIANCE	KRPS	3	44.3 N	24.8 W	18	29	40	2 NM	52	1018.0	18.8	15.5	3	6.5	29	8	13
TFL FREEDOM	9VXX	4	39.0 N	53.5 W	06	27	M 43	5 NM	00	1001.5	16.5	21.5					
	WSSS	4	42.6 N	11.1 W	06	27	40	2 NM	81	1006.5		15.5	3	14.5	29	6	18
AMCO VOYAGER	KADP	4	40.2 N	57.2 W	12	28	35	10 NM	02	1008.0	13.9	21.0	4	8	28	10	28
	KNDB	4	45.6 N	54.8 W	12	30	M 40	2 NM	81	0985.2	6.1		4	6.5	30	6	16.5
	KNDB	5	44.7 N	56.4 W	00	30	M 45			1007.5	4.4		4	6.5	30	9	26
	JFWO	10	36.3 N	13.6 W	18	01	M 24	5 NM		1023.5	17.0	19.5	5	5	34	7	32.5
SAVONITA	DZJT	24	40.6 N	44.6 W	00	21	M 43	5 NM	80	1020.0	21.0	20.0	3	6.5			
AMCO TRADER	KAAI	26	40.5 N	60.8 W	12	14	40	2 NM	80	1013.0	22.2	20.0	5	8	14	8	13
	KNDB	26	41.6 N	64.8 W	12	16	M 30	10 NM	01	1001.2	20.6		4	11.5	16	9	23
T F L INDEPENDENCE	9VVK	26	40.4 N	57.6 W	18	14	M 30	2 NM	07	1013.0	23.0	21.5	8	16.5	14	8	19.5
	GR. LAKES	JUNE															
SENTINEL	WYP8657	8	46.9 N	91.6 W	18	24	M 42	10 NM	02		14.0	7.0	3	6.5			
GEORGE A STINSON	WKP2336	9	47.0 N	91.1 W	00	25	M 40	10 NM	01		17.0	3.0	8	6.5			
J.A.W. IGLEHART	WQ6601	9	45.4 N	84.1 W	06	22	M 22	5 NM	02			10.0	12	19.5			
J.A.W. IGLEHART	WQ6601	14	47.3 N	87.4 W	12	33	M 14	> 25 NM	01		0.0	2.0	12	19.5			

+ Direction for sea waves same as wind direction
I Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

U.S. Voluntary Observing Ship Weather Reports

April, May and June 1984

SHIP NAME	VIA RADIO	VIA MAIL
ABUL KALAM AZAD	4	
ACADIA	27	31
ADDIRIYAH	41	57
ADRIAN MAERSK	56	180
AL SALAMA	5	
ALASKA STANDARD	15	25
ALASKAN	59	176
ALBATROSS IV	45	158
ALBERT MAERSK	24	52
ALERT	1	
ALEUTIAN DEVELOPER	35	168
ALMERIA LYKES	30	76
AMCO TRADER	32	105
AMCO VOYAGER	48	82
AMERICA SUN	43	158
AMERICAN ALTAIR	24	217
AMERICAN APOLLO	29	117
AMERICAN AQUARIUS	61	173
AMERICAN ARGO	31	96
AMERICAN ASTRONAUT	78	171
AMERICAN DRACO	47	170
AMERICAN ENVOY	53	164
AMERICAN HIGHWAY	6	
AMERICAN LANCER	20	
AMERICAN LARK	57	226
AMERICAN LEGION	26	
AMERICAN LIBERTY	56	203
AMERICAN LYNX	68	114
AMERICAN MARKETER	57	152
AMERICAN MERCHANT	88	217
AMERICAN PIONEER	33	154
AMERICAN PURITAN	46	174
AMERICAN RESERVIST	47	188
AMERICAN RESOLUTE	18	120
AMERICAN RIGEL	12	27
AMERICAN SKY	69	32
AMERICAN SUN	29	69
AMERICAN TITAN AK 1008	52	162
AMERICAN TRADER	25	114
AMERICAN VEGA	38	127
AMERICANA	19	29
AMOCO BALTIMORE	30	
AMOCO YORKTOWN	1	
ANNIE JOHNSON	20	47
AQUARIUS	44	135
ARCO ALASKA	21	22
ARCO ANCHORAGE	31	22
ARCO CALIFORNIA	3	
ARCO FAIRBANKS	48	45
ARCO JUNEAU	16	30
ARCO PRUDHOE BAY	28	82
ARCO SAG RIVER	37	98
ARCO TEXAS	20	52
ARCTIC TOKYO	61	148
ARGONAUT	40	76
ARMCO	27	46
ARTHUR M ANDERSON	32	110
ASHLEY LYKES	7	41
ASIA HERON	19	107
ASIA INDUSTRY	10	15
ASIA NO 14	43	133
ATIGUN PASS	51	132
ATLANTIC RAINBOW	8	168
AUSTANGER	12	17
AXEL JOHNSON	43	51
B T ALASKA	58	173
BALD BUTTE	7	86
BALLARD		88
BALTIMORE TRADER	56	163
BAR* ZAN	28	55
BARBER TAIF	28	31
BARBER TENNESSEE	16	
BARBER TERRIER	3	21
BARBER TOBA	26	65
BARBER TONSBERG	18	
BARNWORTH	12	
BASSWOOD WLB388		19
BAY	6	
BAY BRIDGE	102	34
BELO ORIENTE	4	
BENSON FORD	91	143
BERNINA	30	118
BIBB WMEC 31	71	84
BOGASARI DUA	36	127
BOGASARI LIMA	13	84
BOHEME	49	101
BON BATEAU	1	
BORINQUEN	46	150
BOUTWELL WMEC 719	47	108
BRIGHT SUN	77	279
BRINTON LYKES	2	50
BROOKS RANGE	26	
BUNGA MELAWIS	61	155
BUTTONWOOD WLB 306	7	
CANAL ACE		43
CAPPICORN	3	70
CARIBE MAR	1	2
CASON J CALLAWAY	2	35
CENPAC 2	14	187
CHAPMAN	87	74
CHARLES E. WILSON		95
CHARLES LYKES	69	184
CHARLES M BEEGHLEY	10	10
CHARLES PIGOTT		88
CHARLOTTE MAERSK	87	180
CHASE WMEC 718	12	
CHASTINE MAERSK	129	
CHEMICAL PIONEER	12	39
CHERRY VALLEY	33	57
CHESAPEAKE	77	206
CHEVRON ANTWERP	17	189
CHEVRON ARIZONA	40	111
CHEVRON BURNABY	11	167
CHEVRON CALIFORNIA	24	57
CHEVRON COLORADO	25	31
CHEVRON COPENHAGEN	31	162
CHEVRON FELIX	39	104
CHEVRON LOUISIANA	17	27
CHEVRON MISSISSIPPI	47	126
CHEVRON OREGON	29	100
CHEVRON PERTH		72
CHEVRON ROME		75
CHEVRON WASHINGTON	34	33
CHILULA WMEC-153	1	97
CHRISTIAN MAERSK	28	37
CHUEN ON	28	28
CITRUS WLB300	19	38
CLARA MAERSK	32	95
CLIFFORD MAERSK	9	45
CLOVER CGC	2	53
CLOVER TRUST	11	
COLORADO	1	
COLUMBUS AMERICA	28	
COLUMBUS LOUISANA	13	
COPIAPO		33
CORNUCOPIA	26	186
COSMOS	36	43
COURAGEOUS WMEC 622	1	
COVADONGA	20	104
CRYSTAL REED	10	
CRYSTAL STAR	99	172
CYGNUS	66	173
D ALBERTIS	27	51
D L BOWER		237
DA MOSTO	6	
DALLAS WMEC 716	3	
DANA AFRICA	2	
DANA AMERICA	2	
DANA ARABIA	1	
DAVID D. IRWIN	7	14
DAVID P REYNOLDS	40	174
DAVID PACKARD		95
DAVID STARR JORDAN	15	20
DAVIDSON	14	
DE STEIGUER T-AGOR12	15	29
DEFIANCE	22	153
DEL ORO	21	
DEL RIO		17
DELAWARE II	101	224
DELAWARE TRADER	46	170
DELTA NORTE	7	64
DELTA SUD	37	78
DIANA	7	18
DISCOVERER OSS	169	232
DISCOVERER SEVEN SEAS	176	320
DOCTOR LYKES	44	210
DOLLY TURMAN	43	97
DON JUAN	28	17
DRAGOR MAERSK	61	148
DUANE	48	61
DUBHE	24	125
DURABLE	10	31
EASTERN BRIDE	48	
EASTERN DIAMOND	22	120
EASTERN FRIENDSHIP	29	65
EASTERN GLORY	22	65
EASTERN PACIFIC	41	42
EASTERN ROYAL	18	
EASTERN VENTURE	58	
EATON GLORIA	52	
EDGAR M QUEENY	2	
EDITA	22	
EDWARD B. GREENE	69	129
EDWIN H GOTT		148
EILEEN INGRAM	95	186
ELIZABETH LYKES	36	57
EMPIRE STATE	13	
ERNEST R BREECH	61	109
ESSO KOBE	1	
ESSO PALM BEACH	21	64
EVER LOADING		104
EVER SPRING	8	10
EVER VALUE	5	161
EXPORT CHALLENGER	9	78
EXPORT CHAMPION	5	73
EXPORT COMMERCE	7	44
EXPORT FREEDOM	49	143
EXPORT PATRIOT	30	214
EXXON BALTIMORE	3	
EXXON BATON ROUGE	9	9
EXXON CHESTER	3	10
EXXON GETTYSBURG	11	15
EXXON HOUSTON	47	68
EXXON JAMESTOWN	13	4
EXXON LEXINGTON	8	33
EXXON NEW ORLEANS	27	40
EXXON NEWARK	1	30
EXXON NORTH SLOPE	18	41
EXXON PHILADELPHIA	17	47
EXXON SAN FRANCISCO	1	10
EXXON WASHINGTON	5	6
FAIRWEATHER	94	122
FALSTRIA	119	85
FERNCPOF	27	62
FIREBUSH WLB 397	24	
FJORD STAR		36
FORTALEZA	65	228
FRANCIS SINCERE NO 6	28	60
FREDERICK LYKES	18	
FREDERICKSBURG	58	160
FRIENDSHIP	84	
GALLEON DIGNITY	30	100
GALLEON PRIDE	14	176
GALLEON TRUST	1	45
GALVESTON	35	69
GAMA GETAH	2	114
GAMA ROBUSTA	4	
GAS LIBRA	1	
GENEVIEVE LYKES	11	52
GEORGE A SLOAN	19	31
GEORGE A STINSON		140
GERONIMO		87
GLACIER BAY	21	64
GLOBAL FRONTIER	70	176
GOLDEN DAISY		47
GOLDEN ORCHID	8	15
GOWA	25	
GREAT LAND	49	130
GREAT OCEAN	57	47
GREEN AUKLET	19	
GREEN FOREST	29	51
GREEN MAYA	62	87
GREEN SAIKAI	5	26
GREEN STAR	26	17
GREEN SUMA	14	
GULF SHIPPER	11	
H J HAYNES		125
H. LEE WHITE		138
HAMILTON WMEC 715	4	
HANJIN CHEJU		47
HANJIN KWANGYANG		79
HANJIN POHANG	5	5
HARBOUR BRIDGE	66	19
HERBERT C. JACKSON	41	58
HILLYER BROWN	17	36
HOEGH CAIRN	7	
HOEGH CLIPPER	4	23
HOEGH MALLARD	19	
HOEGH MARLIN	48	46
HOEGH MIRANDA	3	84
HOEGH TRIGGER	23	89
HOHSING ARROW	11	183
HOHSING BREEZE	37	190
HOTAKA MARU	91	46

SHIP NAME	VIA RADIO	VIA MAIL
HOWELL LYKES	3	75
HUTLAND VENTURE	8	
IMPERIAL		16
INGER	54	200
INGHAM WHEC 35	23	
IRIS ISLAND	10	83
IRVIN L. CLYMER	33	57
IRVING MIAMI	37	
ITALICA	18	40
J LOUIS	50	170
J T HIGGINS		170
J. L. MAUTHE	61	106
J.A.W. IGLEHART	10	86
JALAMOKAMBI	8	
JAMES LYKES		22
JAPAN APOLLO	89	77
JEAN LYKES	41	79
JOHN G MUNSON	17	74
JOHN LYKES	14	82
JOSEPH LYKES	2	8
JUNO	23	46
JUPITER NO 1	37	49
JUSTINE FOSS		52
JUTHLANDIA	23	11
KANE T-AGS 27	62	240
KAUAI	49	195
KEIYO	16	72
KENNETH E HILL	23	43
KENWOOD	32	176
KEYSTONE CANYON	33	121
KEYSTONER	9	82
KIWALAN	12	
KNORR	41	47
KOFUKU MARU	32	
KOREAN AMETHYST	20	
KOREAN FIR	27	10
KOREAN JACEWON	1	
KOREAN PRIDE	9	
KOREAN WONIS JIN	78	135
KOREAN WONIS ONE	10	45
KOREAN WONIS SEVEN	19	68
KOREAN WONIS SUN	27	25
KRPAN	14	
KYOHO MARU	68	
LAKES STAR	3	
LASH ATLANTICO	9	93
LASH ITALIA	7	13
LASH PACIFICO	16	78
LAURA MAERSK	37	127
LAUST MAERSK	35	91
LAVAUX	37	47
LEDA MAERSK	34	103
LEISE MAERSK	62	130
LESLIE LYKES	10	77
LEWIS WILSON FOY		128
LEXA MAERSK	20	59
LICA MAERSK	18	61
LILLOOET	29	53
LONG LINES	61	107
LOUIS MAERSK	55	106
LOUISE LYKES	4	111
LUCENT STAR	29	
LUCOR MANOR	1	
LUNA MAERSK	48	58
LURLINE	27	218
LYNCH T-AGOR 7	51	199
M.V. DACERANK	73	
M.V. PRESQUE ISLE		113
M.V. TENCHBANK	78	
M/V BURNS HARBOR		174
M/V MYRON C. TAYLOR	52	130
MAERSK TRITON	70	188
MAERSK WIND		40
MAJAPAHIT	32	
MALACCA	17	
MALLORY LYKES	24	87
MALLOW WLB 396	30	
MAMMOTH FIR	6	
MANHATTAN DUKE	67	
MANUKAI	90	221
MANULANI	32	167
MARCHEN MAERSK	2	
MARCONA CONVEYOR		46
MARDI GRAS	9	16
MARIA TOPIC	29	133
MARINE CHEMIST	1	
MARINE SUPERVISOR	55	108
MARJORIE LYKES	10	43
MASON LYKES	47	46
MATARAM	15	
MAUI	69	147
MAUMEE	39	120
MC ARTHUR	9	
MELLON WHEC 717	40	
MELVILLE	78	
MEONIA	68	110
MESABI MINER		106
METEOR T-AKR 9	75	143
MIDGETT WHEC 726	36	
MILLER FREEMAN	183	88
MING AUTUMN	4	
MING GALAXY	1	22
MING GLORY	34	23
MING MOON	2	18
MING STAR	5	
MING SUN	11	38
MING UNIVERSE	14	43
MING WINTER		22
MISSION SANTA CLARA	87	105
MOANA PACIFIC	6	169
MOBIL ARCTIC	36	235
MOKU PAHU	115	90
MORNING GLORY	27	
MT MITCHELL	38	159
MUNRO WHEC 724		65
NACIONAL MONCHIQUE	19	11
NANCY LYKES	13	16
NEPTUNE CRYSTAL	26	
NEPTUNE PEARL	18	143
NEW INDEPENDENCE	57	188
NEWARK	15	164
NICOLET	46	126
NORTHERN LIGHT	6	
NORTHWIND WAGB 282	35	79
NORWAY	44	45
OAKLAND	53	166
OCEAN HOPE	2	
OCEAN STEELHEAD	17	10
OCEANIC	95	204
OCTA	33	114
OGDEN DYNACHEM		71
OGDEN THAMES	3	
OLEANDER	82	99
OLGA TOPIC	31	118
ORCO MINER	43	
ORCO TRADER	43	82
OREMAR	1	
ORIENTAL ANGEL		15
ORIENTAL EDUCATOR	36	147
ORIENTAL SOVEREIGN	8	48
ORIENTAL TAIO	21	9
OTELLO	1	
OTTO N. MILLER	6	114
OVERSEAS ALASKA	1	
OVERSEAS ARCTIC	86	95
OVERSEAS CHICAGO	24	105
OVERSEAS JUNEAU	34	82
OVERSEAS MARILYN	8	60
OVERSEAS NEW YORK	4	51
OVERSEAS VIVIAN	26	109
PACBARON	20	15
PACBARONESS		25
PACDUCHESS	9	13
PACDUKE	44	
PACEMPEROR	29	15
PACGLORY	7	
PACIFIC ANGEL		193
PACIFIC ARROW	84	37
PACIFIC ERA	5	
PACIFIC SAGA	8	
PACIFIC SUNSHINE	3	16
PACIFIC VENTURE	68	
PACIFIC WING	56	
PACKING		24
PACLADY	11	10
PACMAJESTY	4	
PACMERCHANT	21	
PACMONARCH	12	6
PACNOBLE	32	12
PACSTAR	19	
PAN DYNASTY	2	
PAN PACIFIC		14
PARALLA	57	81
PAUL THAYER		59
PEIRCE	7	
PENNSYLVANIA SUN		2
PETERSBURG	53	238
PHILADELPHIA	40	78
PHILIP R CLARKE	19	90
PHOENIX	21	
PIONEER CRUSADER	1	8
PITTSBURGH	72	204
POLAR SEA	35	71
POLAR STAR WAGB-10	9	
POLYNESIA	29	
PORTLAND	34	154
POTOMAC TRADER	7	8
PRESIDENT CLEVELAND	28	21
PRESIDENT GRANT	68	114
PRESIDENT HOOVER	65	120
PRESIDENT JACKSON	29	39
PRESIDENT JEFFERSON	69	148
PRESIDENT JOHNSON	59	33
PRESIDENT KENNEDY	39	
PRESIDENT LINCOLN	48	124
PRESIDENT MADISON	47	140
PRESIDENT MC KINLEY	91	103
PRESIDENT MONROE	51	148
PRESIDENT PIERCE	52	211
PRESIDENT ROXAS	11	83
PRESIDENT TAYLOR	10	
PRESIDENT TYLER	50	122
PRESIDENT VAN BUREN	59	203
PRESIDENT WASHINGTON	51	143
PRESIDENT WILSON	63	143
PRINCE OF TOKYO	34	180
PROVINCIA DE EL ORO	19	65
PUNTA BRAVA	26	42
PUNTA MALVINAS	7	4
QUATSINO SOUND		52
QUINTINA	36	14
RAINIER	29	29
RANGE SENTINEL	16	30
RED ARROW	44	
REGINA MAERSK	59	157
RESEARCHER	241	295
RIGOLETTO	77	45
ROACHBANK	90	
ROBERT E LEE	30	
ROSE	2	83
ROSE CITY	4	
ROSINA TOPIC		83
ROYAL VIKING SKY	7	
ROYAL VIKING STAR	15	
RUSH WHEC 723	1	3
RUTH LYKES	17	42
S T CRAPO	13	45
S.S. LNG TAURUS	5	154
S.S. MOBIL MERIDIAN	60	158
S.S. PONCE	49	125
S/S EXXON BOSTON	79	71
SACRAMENTO	31	
SAINT LOUIS	47	102
SALVADOR	4	20
SAM HOUSTON	20	
SAMOA	55	96
SAMUEL S	29	1
SAN PEDRO	42	126
SANSINENA II	11	29
SANTA JUANA	48	
SANTA MAGDALENA	19	45
SANTA MARIA	61	108
SANTA MARIANA	37	98
SAUDI MAKKAH	17	
SAVONITA	15	29
SEA ASTRA	53	23
SEA BELLS		114
SEA DIAMOND		187
SEA FAN		133
SEA LANTERN	27	124
SEA LIGHT		191
SEA QUEEN NO 1	35	100
SEALAND ADVENTURER	63	157
SEALAND CONSUMER	36	169
SEALAND DEFENDER	82	183
SEALAND DEVELOPER	86	212
SEALAND ECONOMY	49	178
SEALAND ENDURANCE	52	139
SEALAND EXPRESS	65	82
SEALAND FREEDOM	46	150
SEALAND INDEPENDENCE	40	137
SEALAND INNOVATOR	73	152
SEALAND LEADER	34	121
SEALAND LIBERATOR	63	181
SEALAND PACER	24	158
SEALAND PATRIOT	54	162
SEALAND PIONEER	16	158
SEALAND PRODUCER	48	172
SEALAND VENTURE	87	202
SEALAND VOYAGER	55	164
SEALIFT ANTARTIC	30	
SEALIFT ARABIAN SEA	24	30
SEALIFT MEDITERPANEAN	65	136
SEDGE WLB 402	36	
SENATOR	38	67
SEVEN OCEAN	23	15
SHERMAN WHEC 720	55	36
SHINKOO MARU	58	49
SHIRLEY LYKES	8	39
SKAUGRAN	68	135
SKOUBORD	31	170
SOCONY VACUUM	32	139

SHIP NAME	VIA RADIO	VIA MAIL
SOHIO INTREPID	2	12
SOLON TURMAN		11
SOUTH LIGHT	50	
SOUTHWEST CAPE	35	
SOVEREIGN VENTURE	17	39
SPARROWS POINT	24	136
SPIRIT OF LIBERTY	34	
SS B T SAN DIEGO	68	310
STAR CARRIER	8	26
STAR DIEPPE	20	
STAR ENTERPRISE	18	18
STAR MALAYSIA	14	39
STAR PHILLIPPINES	8	
STAR THAILAND	12	60
STARWARD	26	13
STEADFAST	23	
STELLA LYKES	16	75
STEWART J. CORT		33
STOLT LION	2	
STONEWALL JACKSON	34	130
STR. WILFRED SYKES	1	
STREAM DOLPHIN	36	16
STREAM HAWSER	9	13
SUGAR ISLANDER	22	
SUN VIKING	16	51
SUNBELT DIXIE	124	138
SURVEYOR	103	188
SWEETBRIER WLB 405	6	
T F L INDEPENDENCE	47	176
T F L LIBERTY	21	180
T/V STATE OF MAINE	26	
TAI CORN	19	
TAIKO VENTURE	68	62
TANEY WHEC 37	22	
TARASCO	51	44
TEXACO GMENT	8	
TEXACO RHODE ISLAND	3	27
TEXAS CLIPPER	26	
TEXAS TRADER	42	133
TFL DEMOCRACY	34	116
TFL ENTERPRISE	40	160
TFL EXPRESS	25	153
TFL FRANKLIN	33	
TFL FREEDOM	27	161
TFL JEFFERSON	16	
THOMAS G THOMPSON	66	89
THOMAS WASHINGTON	69	56
THOMPSON LYKES	6	85
THOMPSON PASS	3	55
TILLIE LYKES	32	179
TONCI TOPIC	19	143
TONSONIA	25	158
TOWER BRIDGE	70	10
TOWNSEND CROMWELL	142	247
TOYOTA #24	142	
TRANSCOLUMBIA	73	169
TROPIC SUN	21	116
TYSON LYKES	46	128
ULTRAMAR	18	
ULTRASEA	3	31
UNITED SEA ANGEL	1	
UNIVERSE	36	
USCGC BARQUE EAGLE	1	
USCGC ESCAPE		2
USCGC IRONWOOD WLB 297	11	
USCGC LAUREL (WLB 291)	15	27
USCGC LIPAN	59	110
USCGC RED CEDAR		6
USCGC RESOLUTE WHEC 62	12	
USCGC SUNDEW WLB 404	1	71
USCGC VALIANT(WMEC-621	19	
USCGC VIGOROUS	1	
USGS S.P. LEE	194	110
USMS NORTH STAR III	12	14
USNS APACHE	27	
USNS BARTLETT	84	129
USNS COMET TAKR 7	26	21
USNS MISSISSINEWA		168
USNS MOHAWK	59	95
USNS NODAWAY (T-AO678)		87
USNS PAWCATUCK TAO-108		107
USNS POWHATAN TATF 166	83	111
USNS RIGEL TAFS8		112
USNS SEALIFT CHINA SEA	83	135
USNS SEALIFT PACIFIC	30	160
USNS SIRIUS		43
USNS SOUTHERN CROSS	20	23
USNS WACCAMAW(TAO-109)		83
VALLEY FORGE	5	
VALOR	2	39
VAN CONQUEROR	35	107
VAN HAWK	52	67
VELMA LYKES	27	109
VENTURE STAR		17
VENTUROUS-WPC 625	1	
WALCHAND	47	133
WALTER RICE	35	191
WASHINGTON TRADER	31	178
WECOMA	92	156
WESTERN SUN	8	6
WESTWARD VENTURE	43	100
WHITING	28	37
WILLIAM A. ROESCH		88
WILLIAM CLAY FORD	8	
WILLIAM E MUSSMAN	1	36
WILLIAM HOOPER	2	
WILLIAM J DELANCEY		6
WOLVERINE		94
WOODRUSH WLB407	11	
WORLD CANDOUR	49	2
WORTH		36
YAMASHIN MARU	122	54
YOCONA WHEC 168	8	74
ZEPHUNTER	50	98
ZEUS	61	154
ZIM HONGKONG	18	
ZOELLA LYKES	27	104
3EBR	3	14
3EGC2		116
3EJV2		67
3EKJ2		221
3ELX	6	61
3EPA	12	41
3EQJT		41
3ESG2		22
3ETZ	9	11
3EUB	17	26
3EWL	81	98
3EWQ	50	238
3EXD2		18
3FAB	24	151
3FDZ2		170
3FGE2		194
3FHO2		141
3FHOZ		32
3FIZ2		99
3FJE2		38
3FMU	64	94
3FNF2		120
3FOR2		55
3FRB2		31
3FWL2		46
3ZTZ		5
3ZUB		11
5HQI		90
5LAW	30	48
5LOT		33
5LOZ	6	13
5LUB	35	251
5LWO		79
6ZMN	10	131
6ZRT	42	185
6ZSY	16	28
9VYW		169
A8FW	42	54
ATUI	27	39
BHFK	13	45
BKHO		10
BMDM	11	104
C6FA3		206
CBAC	3	13
CSDB	34	93
CSDQ	25	85
CSDU	25	43
D5AL	7	10
D5DE	21	59
D5DW	34	147
D5DZ	20	189
D5HD	5	4
D5HZ	12	78
D5KF	34	43
D5S0	7	15
D5TV		12
D7BP	3	11
D7YL	22	40
D9DK		7
D9HR	21	21
D9HS	22	37
D9HT	1	5
DDKX	9	11
DUWZ		45
DVYZ		13
DZDI	1	15
DZGM	11	15
DZHC	16	67
DZIA	1	54
DZLE		69
DZLF		37
DZQK	13	76
DZUT	24	142
DZXI	23	141
EAFG		79
ELAJ4		29
ELBG2		2
ELBJ3		32
ELBM4		83
ELCF3		9
ELCF4		67
ELDK3		36
ELDS2		6
ELDT5		50
ELDU4		14
ELHJ	25	27
ELOC	23	28
GYEV		3
GZOW	51	63
H3DB	24	73
H8DF	46	67
H8JV	3	11
H8YU		33
H8ZQ	43	146
H9KJ	2	38
H9WB	15	21
HBDP		129
HEZH		27
HOMH	18	155
HOML	12	39
HONF	7	69
HPCC	7	64
HPET	17	160
HPGQ		26
HPOP	29	64
HPTF	9	22
HSDF		22
HZLG	62	197
JAVB	5	35
JFWO	17	43
JKMG	8	4
JKXM	21	25
JMGK	45	59
KACN	41	98
KBLF		35
KCAO	3	21
KCBK	17	27
KCIP		35
KDDA		22
KDFP		27
KDLA		41
KFVO		36
KGBA		66
KGJF	47	169
KGPB	24	52
KGYE	39	117
KIGP	26	46
KLCZ		133
KLSM		21
KMLD	16	26
KNCX	7	22
KNDB	4	99
KONB		79
KPGO		24
KRCJ	39	107
KRDB	15	152
KTCH		2
LDEF	10	20
LFKW		10
LIQL		96
LKFQ		34
LMWR	6	4
LPUB	8	11
LZFW		17
NAHR		30
NHMX		50
NIZX		29
NJAX	13	32
NJOV	40	76
NJTA		9
NJTD	20	59
NPTF		75
NSHI		236
NTRI	100	84
NYGG	76	173
NZIT	73	88
OWCY	7	26
OWLY		26
OXFY		51
OXTH	6	21
OZNA		26
OZSO	38	56
S6FA	17	52
SKXZ	26	113
TAAM	13	20
WAHR		14
WCSJ		37
WDZR	32	192
WFKW	61	129
WGJE	1	146
WGJF	35	120
WHMR		13
WHNL	2	90
WLDP	29	60
WLDU	52	171
WLGF	39	122
WLSH		49
WNES		22
WRGO	57	187
WSBG		5
WSSS	30	114
WXHK		20
WZHK	30	37
YCSG	22	66
YCXW	6	13
ZCKP	49	86
ZCUT	48	92
ZLAK7		14
ZORY		2

SUMMARY: GRAND TOTAL VIA RADIO 22801 GRAND TOTAL VIA MAIL 59962

U.S. NDBC Climatological Data

April, May and June 1984

APRIL 1984

BUOY	LAT	LONG	AIR TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	SEA TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	AIR-SEA TEMPERATURE DIFFERENCE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	461	21	22.2	24 04	10.6	01 00	18.1	461	21	23.9	23 14	18.1	22 04	21.5	720	30	01.3	20 08	-08.4	22 18	-05.1
41002	32.3N	075.3W	236	30	23.6	27 20	13.5	01 02	19.8	238	30	25.5	29 20	19.9	01 02	21.8	238	30	01.6	28 08	-08.5	06 08	-02.0
41006	29.3N	077.3W	719	30	25.3	27 20	17.8	17 18	21.9	719	30	25.7	27 22	22.1	25 04	23.3	719	30	01.4	24 07	-05.1	17 18	-01.4
42001	25.9N	089.7W	261	30	26.6	12 21	16.6	06 09	22.8	261	30	26.1	30 22	21.2	01 09	23.1	262	30	01.8	27 06	-04.6	06 09	-00.2
42002	26.0N	093.5W	180	28	24.4	11 21	20.4	01 00	22.4	004	04	23.6	11 21	21.3	01 00	22.9	236	30	01.7	08 21	-02.6	16 03	-00.7
42003	26.0N	085.9W	718	30	28.7	13 19	22.1	06 07	26.3	719	30	29.4	13 23	24.5	18 06	25.9	719	30	02.7	22 11	-03.5	01 19	00.4
42007	30.1N	088.9W	714	30	24.6	30 22	11.3	05 15	19.3	714	30	23.9	30 21	16.3	01 12	19.2	714	30	02.7	14 22	-05.8	05 12	00.0
42008	28.7N	095.3W	713	30	25.3	03 21	11.1	05 13	20.2														
42009	29.3N	087.5W	715	30	23.6	28 19	13.2	05 19	19.6	715	30	24.0	30 21	17.8	01 08	20.0	715	30	02.0	03 10	-05.2	05 19	-00.4
42011	29.6N	093.5W	221	18	24.2	14 23	17.2	01 00	21.6														
44004	38.5N	070.7W	708	30	17.3	24 05	04.4	10 03	11.5	708	30	18.6	19 17	12.6	10 11	15.9	709	30	01.6	15 23	-11.8	22 10	-04.4
44005	42.7N	068.3W	704	30	09.2	06 07	00.0	09 19	05.1	720	30	06.3	02 19	04.9	22 05	05.4	720	30	03.8	06 07	-05.2	09 10	-00.4
44007	43.5N	070.1W	693	30	12.7	28 17	00.0	09 05	04.8														
44008	40.5N	069.4W	195	10	10.4	30 23	02.8	22 18	06.3	195	10	07.4	30 17	04.7	23 04	05.3	713	30	04.9	24 12	-02.1	22 22	-00.2
44009	38.5N	074.6W	221	11	18.1	26 21	03.9	23 04	09.9	221	11	10.2	29 19	05.1	01 00	08.4	715	30	09.1	26 21	-03.9	23 04	01.0
44010	36.9N	075.7W	716	30	16.6	26 20	06.2	01 08	10.7	716	30	15.8	26 21	06.3	01 03	09.9	716	30	04.4	05 21	-02.7	22 23	00.8
45002	45.3N	086.3W	261	12	09.6	28 00	01.4	20 10	03.9	264	12	02.1	29 19	01.0	20 10	01.7	264	12	07.7	28 00	-00.4	30 19	02.2
45003	45.3N	082.8W	242	11	08.7	27 23	01.0	21 12	03.9	244	11	01.6	28 15	01.2	21 01	01.4	244	11	07.2	27 23	-00.2	21 12	02.5
45007	42.7N	087.1W	719	30	10.5	30 06	00.9	17 18	04.0	719	30	02.4	02 22	01.8	01 03	02.1	719	30	08.4	30 06	-01.1	17 18	01.9
45008	44.3N	082.4W	145	07	10.3	28 22	02.8	25 00	05.3	145	07	01.6	29 15	00.6	26 05	01.1	145	07	09.1	28 22	01.8	25 00	04.2
46001	56.3N	148.3W	706	30	05.8	12 01	00.1	23 15	03.8														
46002	42.5N	130.3W	720	30	12.0	14 00	07.0	24 11	09.5	720	30	11.8	22 01	10.5	12 04	10.8	720	30	01.4	14 00	-03.9	24 11	-01.3
46003	51.9N	155.7W	235	30	05.8	25 21	00.0	13 12	03.0	239	30	04.6	07 00	04.0	01 18	04.2	239	30	01.6	25 21	-04.3	22 03	-01.3
46004	51.0N	136.0W	567	25	08.3	20 00	03.6	13 07	06.6	567	25	09.8	27 02	07.4	07 12	07.7	717	30	00.6	20 23	-03.9	13 07	-01.0
46005	46.1N	131.0W	608	26	10.6	05 00	04.1	10 06	07.8	720	30	11.0	05 03	07.6	24 05	09.3	720	30	02.2	25 13	-05.2	10 06	-01.4
46006	40.7N	137.7W	712	30	13.1	30 23	05.3	15 20	10.1	718	30	14.2	27 03	11.3	08 11	12.0	718	30	00.4	11 19	-06.2	15 20	-01.9
46011	34.9N	120.9W	719	30	16.3	15 00	06.0	27 14	11.2	717	30	13.9	15 00	10.0	27 14	11.4	719	30	03.3	14 15	-02.8	03 16	-00.2
46012	37.4N	122.7W	718	30	16.3	14 20	09.4	26 15	11.5	719	30	14.1	14 23	09.8	27 13	11.2	719	30	03.9	14 19	-02.1	15 14	00.3
46013	38.2N	123.3W	716	30	12.8	22 02	08.0	26 14	10.5	716	30	11.6	05 01	08.1	26 10	10.0	716	30	02.6	28 01	-01.2	01 00	00.5
46014	39.2N	124.0W	720	30	14.8	15 02	07.9	03 13	10.3	720	30	12.7	14 23	08.6	26 11	10.3	720	30	02.6	15 02	-02.6	19 09	00.0
46017	60.3N	172.3W	006	04	01.0	27 21	00.1	03 21	00.5														
46022	40.8N	124.5W	718	30	13.6	14 01	07.3	25 16	10.2	718	30	13.2	13 21	09.1	28 09	11.0	718	30	02.1	15 10	-03.7	19 17	-00.7
46023	34.3N	120.7W	715	30	15.6	14 20	09.5	27 14	11.9	715	30	15.0	14 23	10.4	28 09	12.7	716	30	02.5	13 16	-03.3	01 12	-00.7
46024	32.8N	119.5W	386	17	16.1	15 01	11.0	26 12	13.0	386	17	16.6	14 22	13.2	17 23	14.1	386	17	00.9	22 15	-02.9	26 12	-01.2
46025	33.6N	119.0W	718	30	18.9	13 23	11.7	26 11	14.6	392	17	17.8	23 23	14.8	27 16	15.9	392	17	02.8	21 19	-03.8	26 11	-01.2
46026	37.8N	122.7W	715	30	19.9	14 20	07.8	26 13	10.3	715	30	12.8	14 23	08.7	26 16	10.6	715	30	07.8	14 20	-02.5	01 07	-00.3
46028	35.8N	121.7W	718	30	15.3	14 22	09.0	26 13	11.1	718	30	14.4	15 01	09.7	25 03	11.1	718	30	02.8	14 22	-02.6	19 12	00.0
46029	46.2N	124.2W	713	30	13.9	14 19	05.2	24 15	09.1	714	30	12.2	15 00	09.0	06 13	10.2	715	30	03.1	14 19	-04.7	24 15	-01.1
51001	23.4N	162.3W	717	30	24.8	25 04	19.9	26 10	23.3	717	30	24.8	13 00	23.0	05 16	24.0	717	30	00.8	25 04	-03.7	14 00	-00.7
BURL1	28.9N	089.4W	718	30	26.2	30 19	11.6	05 14	18.8														
CSBF1	29.7N	085.4W	712	30	24.5	28 19	11.8	02 10	18.5														
DBLN6	42.6N	079.5W	501	24	21.8	28 13	00.0	09 10	06.4														
DISW3	47.1N	090.7W	602	30	16.2	25 22	00.0	02 13	03.4														
GLLN6	43.5N	076.3W	709	30	19.1	27 23	00.0	09 10	05.2														
NWPO3	44.6N	124.1W	458	20	14.9	15 01	01.9	26 13	08.7														
PTAT2	27.8N	097.1W	713	30	29.2	03 22	14.7	04 15	21.1														
PTGC1	34.6N	120.7W	142	08	11.2	28 20	07.9	27 13	09.9														
ROAM4	47.9N	089.3W	666	30	12.0	27 19	00.0	01 05	02.9														
SBIO1	41.7N	082.8W	711	30	23.7	26 23	00.0	01 06	06.6														
SGNW3	43.8N	087.7W	719	30	16.7	28 04	00.4	01 08	04.4														
SISW1	48.3N	122.9W	707	30	15.1	14 18	05.2	04 14	08.7														
SRST2	29.7N	094.1W	682	30	28.6	03 20	09.2	17 10	19.3														
WPOW1	47.7N	122.4W	718	30	19.5	14 22	04.4	26 13	08.9														

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BUOY	LAT	LONG	PRESSURE (MB) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	WIND SPEEDS (KNOTS) OBS	MAX	DY HR	DIR	MEAN WIND SPEED (KNOTS) N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	659	29	1024.1	30 03	1000.6	24 09	1014.0	715	40	24 03	230	14.0	12.9	11.6	11.5	21.0	17.6	18.8	17.3	16.8
41002	32.3N	075.3W	236	30	1025.0	30 02	1001.9	11 08	1015.1	236	29	11 11	050	6.5	9.3	11.7	12.5	13.7	13.0	15.5	12.9	12.7
41006	29.3N	077.3W	719	30	1023.3	30 15	1003.0	11 09	1015.1	701	28	04 21	170	11.3	8.6	9.5	11.6	13.1	13.0	13.9	12.4	12.5
42001	25.9N	089.7W	031	02	1019.4	30 18	1015.2	30 09	1017.1	260	31	08 06	140	13.7	8.8	10.6	17.9	14.6	9.1	18.1	19.3	15.5
42002	26.0N	093.5W	232	30	1020.3	05 15	1003.9	21 09	1012.4	229	28	08 03	130	11.9	8.9	6.3	13.9	8.3	4.8	8.5	11.5	11.4
42003	26.0N	085.9W	719	30	1020.3	30 17	1007.1	11 22	1013.8	716	34	03 10	170	11.2	10.1	12.7	17.3	18.0	18.9	19.1	17.0	15.9
42007	30.1N	088.9W	714	30	1021.9	01 16	1005.7	09 00	1012.9	713	24	08 03	120	12.9	8.5	12.3	13.2	11.7	11.0	12.8	14.6	12.7
42008	28.7N	095.3W	713	30	1022.6	05 16	1000.6	21 02	1011.4	713	28	02 12	130	14.6	13.0	11.4	13.6	12.7	9.3	9.7	13.6	13.0
42009	29.3N	087.5W	715	30	1020.9	01 16	1006.1	03 21	1012.8	709	26	03 22	220	7.8	7.6	10.6	12.4	9.9	9.4	14.2	14.0	11.9
42011	29.6N	093.5W	714	30	1021.0	30 17	1003.2	21 04	1011.5	710	33	29 08	150	16.3	16.2	11.6	16.4	14.6	12.2	8.7	16.2	14.8
44004	38.5N	070.7W	708	30	1024.4	04 01	996.3	24 09	1012.9	705	25	18 20	280	13.8	7.0	12.4	13.9	13.4	9.7	14.9	12.8	13.3
44005	42.7N	068.3W	720	30	1025.8	04 14	992.3	24 21	1012.5	713	27	22 02	340	16.7	11.6	14.1	13.7	9.0	9.3	7.4	10.0	12.7
44007	43.5N	070.1W	713	30	1027.7	09 14	991.6	25 07	1013.5	703	25	05 23	120	10.8	12.3	12.2	9.7	8.1	8.6	5.6	10.4	10.1
44008	40.5N	069.4W	661	29	1023.3	29 15	994.1	24 15	1012.0	709	29	06 03	150	13.5	8.5	10.9	13.5	8.8	9.4	10.3	11.0	11.4
44009	38.5N	074.6W	600	29	1027.0	29 15	997.2	24 10	1013.5	697	29	05 01	150	10.6	7.3	11.9	11.8	9.9	8.5	10.4	12.2	10.3
44010	36.9N	075.7W	716	30	1026.1	29 15	994.0	05 20	1012.9	095	23	05 04	150	5.0	12.9	7.3	12.7	8.4	7.3	7.5	6.5	09.8
45002	45.3N	086.3W	264	12	1032.8	21 16	983.5	30 16	1011.4	262	26	30 19	280	5.1	9.5	9.4	6.8	11.0	9.6	11.5	3.2	09.2
45003	45.3N	082.8W	244	11	1032.5	21 17	986.6	30 15	1012.3	243	25	30 23	250	7.3	9.1	10.2	12.5	11.6	8.6	9.4	7.7	09.8
45007	42.7N	087.1W	719	30	1027.3	21 16	989.0	30 10	1012.3	717	32	30 11	200	12.6	10.1	11.9	11.1	9.6	9.0	9.1	10.9	11.1
45008	44.3N	082.4W	145	07	1026.2	29 14	990.3	30 14	1011.4	145	32	30 20	220		3.4	8.0	10.1	10.3	14.3	8.5	4.8	10.4
46001	56.3N	148.3W	717	30	1030.4	25 22	967.9	09 10	1004.8	710	28	09 00	100	9.7	11.9	15.4	13.8	10.3	10.2	12.7	10.4	11.5
46002	42.5N	130.3W	720	30	1033.0	24 19	997.9	18 01	1019.2	720	28	09 11	190	12.9	8.3	9.1	13.8	16.0	12.4	13.6	13.0	13.3
46003	51.9N	155.7W	239	30	1024.1	24 09	963.7	08 21	1006.9	237	33	09 06	310	17.4	12.2	19.6	14.1	13.6	12.8	14.5	16.2	14.7
46004	51.0N	136.0W	689	30	1033.8	26 06	971.8	07 08	1008.4	708	35	09 05	150	5.5	8.8	14.0	18.5	14.4	13.7	14.6	7.5	13.8
46005	46.1N	131.0W	720	30	1032.3	24 23	992.0	18 03	1015.7													
46006	40.7N	137.7W	718	30	1037.3	25 06	1002.2	17 18	1021.4	717	35	09 03	210	8.5	9.3	3.6	9.1	14.6	17.7	18.6	14.9	15.7
46011	34.9N	120.9W	719	30	1024.8	29 18	1007.8	06 11	1016.9	711	34	26 02	310	10.1	3.1	5.8	7.9	6.9	5.9	7.2	19.1	17.2
46012	37.4N	122.7W	718	30	1025.4	21 18	1009.8	06 13	1018.5	719	40	25 02	330	17.1	4.5	2.9	10.6	14.2	6.1	7.4	17.9	15.9
46013	38.2N	123.3W	716	30	1026.9	21 16	1010.5	06 04	1019.4	699	33	25 01	300	3.4	2.9	1.3	12.5	8.3	6.1	12.8	18.2	16.1
46014	39.2N	124.0W	720	30	1027.0	21 18	1010.0	18 13	1018.8	630	32	25 01	310	9.7	4.0	3.2	11.7	6.0	6.2	7.4	15.9	13.0
46016	63.3N	170.3W	237	30	1026.9	26 21	1000.9	01 00	1015.3	237	43	04 21	070	10.3	21.5	21.0	5.9	7.3	7.7	13.0	7.1	17.0
46017	60.3N	172.3W	229	30	1028.9	12 21	988.0	05 03	1013.2	220	31	04 21	070	10.4	16.2	15.7	10.4	9.7	10.0	9.9	6.4	12.3
46022	40.8N	124.5W	718	30	1030.1	21 18	1008.0	18 13	1019.9	699	31	25 01	340	15.7	5.4	4.1	9.6	16.6	11.2	9.2	11.6	13.6
46023	34.3N	120.7W	716	30	1025.2	29 21	1006.9	06 09	1016.5	715	39	26 04	320	22.7	12.0	13.7	12.2	7.7	9.7	12.0	24.7	23.3
46024	32.8N	119.5W	386	17	1023.9	29 18	1008.7	25 01	1015.0	386	34	26 03	310						7.2	13.6	18.7	18.0
46025	33.6N	119.0W	718	30	1022.9	29 19	1004.2	06 12	1014.0	696	29	01 01	290	5.4	5.2	4.8	6.6	3.1	4.1	11.7	11.7	09.9
46026	37.8N	122.7W	715	30	1025.4	20 19	1009.6	06 09	1018.7	707	31	25 02	320	3.9	6.4	11.5	11.9	11.6	6.1	9.5	16.4	13.9
46028	35.8N	121.7W	718	30	1025.5	29 20	1010.2	06 11	1018.6	714	34	25 04	320	4.2	3.2	7.3	7.6	6.0	3.3	9.5	18.4	16.9
46029	46.2N	124.2W	714	30	1030.0	22 05	999.9	09 23	1017.3	707	34	09 22	170	12.7	5.5	6.4	14.3	15.4	11.3	8.6	12.3	12.2
51001	23.4N	162.3W	717	30	1025.6	03 21	1012.6	25 14	1021.4	717	22	14 02	050	12.3	14.5	14.3	11.4	8.5	8.6		9.0	14.0
BURL1	28.9N	089.4W	718	30	1019.7	01 16	1006.3	03 23	1012.5	717	38	02 19	120	8.0	10.4	14.6	14.3	11.8	15.4	15.7	14.1	13.8
CSBF1	29.7N	085.4W	711	30	1022.3	01 15	1007.1	04 21	1014.5	712	25	05 01	260	2.7	4.2	7.3	5.6	8.0	8.0	12.8	6.3	07.8
DBLN6	42.6N	079.5W	645	30	1029.8	09 13	995.0	17 07	1013.7	712	38	30 22	240	7.4	8.2	6.7	8.4	6.8	12.5	6.7	4.1	09.2
DISW3	47.1N	090.7W	716	30	1032.9	21 15	989.8	27 20	1013.6	710	34	28 18	220	9.1	13.1	8.3	7.5	11.8	11.8	9.5	11.0	11.2
GLLN6	43.5N	076.3W	717	30	1031.3	09 14	988.8	06 07	1013.2	715	36	30 20	210	6.9	8.2	7.5	12.1	12.4	11.2	10.7	7.0	09.2
NWPO3	44.6N	124.1W	457	20	1029.8	22 05	1004.0	18 10	1019.9	453	34	12 05	190	13.8	3.6	4.4	4.1	12.6	12.9	8.1	8.7	09.6
PTAT2	27.8N	097.1W	251	12	1018.8	04 11	999.4	26 23	1009.2	710	31	29 17	150	12.7	9.8	10.0	15.2	14.1	4.9	9.3	8.8	12.4
PTGC1	34.6N	120.7W	168	08	1024.4	29 17	1009.3	24 11	1016.1	167	48	26 03	330	19.6							27.5	21.3
ROAM4	47.9N	089.3W	714	30	1037.0	21 15	991.9	30 14	1016.6	712	41	27 20	140	17.5	15.6	12.6	14.6	7.7	15.3	15.6	7.5	14.2
SBIO1	41.7N	082.8W	716	30	1029.2	08 14	997.5	05 10	1013.5	716	39	30 15	250	5.9	9.0	7.7	7.8	10.7	9.4	11.9	10.8	09.3
SGNW3	43.8N	087.7W	719	30	1030.3	21 15	983.9	30 10	1013.4													
SISW1	48.3N	122.9W	705	30	1028.7	22 06	999.2	10 02	1016.2	701	34	09 15	140	6.5	4.8	7.6	15.4	7.8	5.5	10.3	7.6	10.5
SRST2	29.7N	094.1W	326	14	1021.1	30 16	1003.8	26 22	1012.2	696	30	29 08	150	8.4	9.8	10.8	14.7	12.8	9.7	7.7	9.3	11.8
WPOW1	47.7N	122.4W	718	30	1028.6	22 05	1001.4	10 03	1016.5	718	29	12 13	180	8.3	4.4	3.5	4.8	11.0	8.7	2.8	2.5	08.7

APRIL 1984			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)							
BUOY	LAT	LONG	OBS	MAX	DY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	715	6.5	05	11	2.3		23.6	46.9	23.2	6.4	0.2		
41002	32.3N	075.3W	030	4.5	05	08	2.1		50.0	26.6	20.0	3.3			
41006	29.3N	077.3W	716	4.5	11	20	1.7	14.1	42.3	28.7	13.9	0.8			
42001	25.9N	089.7W	260	3.0	08	06	1.4	15.7	47.6	33.8	2.6				
42002	26.0N	093.5W	220	4.0	08	06	1.6	16.3	40.9	35.4	6.8	0.4			
42003	26.0N	085.9W	718	3.5	17	10	1.4	14.2	55.4	26.1	4.1				
42007	30.1N	088.9W	623	1.5	02	20	0.7	56.8	43.1						
44004	38.5N	070.7W	605	7.5	05	19	2.5	1.6	23.6	43.1	20.3	9.2	1.9		
44005	42.7N	068.3W	717	5.5	06	08	2.2	5.4	29.2	33.7	23.0	8.5			
44007	43.5N	070.1W	643	5.0	06	06	1.2	28.4	51.3	12.4	6.0	1.7			
44008	40.5N	069.4W	685	7.0	06	04	2.2	3.0	24.9	48.6	17.0	4.8	1.4		
44010	36.9N	075.7W	643	2.5	05	03	0.8	50.8	46.5	2.6					
45002	45.3N	086.3W	212	4.0	30	20	1.0	54.7	31.6	9.9	2.3	1.4			
45003	45.3N	082.8W	180	4.0	30	23	0.9	52.7	40.0	3.3	3.3	0.5			
45007	42.7N	087.1W	655	5.0	30	13	1.1	40.0	38.3	17.2	3.3	1.0			
45008	44.3N	082.4W	115	4.5	30	20	0.9	61.7	26.0	6.0	1.7	4.3			
46001	56.3N	148.3W	706	8.5	09	07	2.8		14.8	41.6	26.0	15.5	1.5	0.2	
46003	51.9N	155.7W	239	10.0	09	18	3.5		5.4	29.7	33.0	22.5	6.2	2.5	0.4
46004	51.0N	136.0W	712	8.5	10	01	3.7		8.9	25.1	22.4	27.2	14.0	2.1	
46005	46.1N	131.0W	720	9.5	11	00	3.4		10.2	30.6	23.4	25.9	6.5	3.0	
46006	40.7N	137.7W	718	9.0	19	01	3.2	2.3	16.1	28.9	23.6	18.2	8.3	2.2	
46011	34.9N	120.9W	712	6.5	25	04	2.8	0.1	22.4	27.2	28.0	20.6	1.4		
46012	37.4N	122.7W	716	6.0	25	05	2.5	2.6	24.8	29.4	29.7	13.1	0.1		
46013	38.2N	123.3W	714	6.0	11	19	2.9	0.8	14.5	27.3	29.5	27.3	0.4		
46014	39.2N	124.0W	720	5.5	11	06	2.7	2.9	13.1	34.0	31.8	18.0			
46022	40.8N	124.5W	718	7.5	11	13	2.9	1.5	15.7	30.5	28.4	21.7	2.0		
46023	34.3N	120.7W	710	6.5	25	06	3.1		13.9	25.6	30.5	28.1	1.6		
46025	33.6N	119.0W	718	9.0	26	03	1.7	4.7	50.0	34.6	10.0	0.5			
46026	37.8N	122.7W	708	4.0	24	15	2.0	4.0	31.4	44.4	19.0	0.8			
46028	35.8N	121.7W	361	5.5	06	16	2.9		13.5	31.3	27.7	27.4			
46029	46.2N	124.2W	710	7.0	10	00	2.7		26.0	31.1	22.3	18.7	1.6		
51001	23.4N	162.3W	717	4.5	14	06	2.7		4.8	47.8	41.9	5.2			

APRIL 1984			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		3.4	17.8	54.0	23.1	1.8		14.0	10.7	5.1	2.3	15.3	17.8	17.7	17.1
41002	32.3N	075.3W		6.4	32.2	55.5	5.9			5.5	13.2	7.0	8.6	17.7	16.8	21.7	9.4
41006	29.3N	077.3W		2.4	39.5	52.2	5.8			4.2	3.4	6.2	16.2	21.8	12.8	23.5	11.9
42001	25.9N	089.7W		3.1	21.5	55.4	20.0			6.4	9.6	10.3	42.8	12.3	3.0	3.4	12.2
42002	26.0N	093.5W		7.4	33.6	57.6	1.3			13.0	6.1	13.0	42.8	4.7	3.5	6.6	10.4
42003	26.0N	085.9W		2.9	18.0	62.7	16.1	0.3		6.0	5.7	16.5	34.4	13.6	2.8	5.2	15.7
42007	30.1N	088.9W		2.2	28.2	68.2	1.4			4.0	2.7	10.0	31.5	13.5	10.7	13.6	14.0
42008	28.7N	095.3W		3.5	30.3	58.8	7.4			10.6	3.1	13.0	31.6	22.3	3.3	3.0	13.2
42009	29.3N	087.5W		5.2	35.4	57.4	2.0			5.8	2.3	13.3	31.5	10.5	6.3	17.1	13.6
42011	29.6N	093.5W	0.7	3.7	18.3	65.5	12.5			10.6	2.7	2.5	25.1	29.5	12.6	4.3	12.7
44004	38.5N	070.7W		3.0	24.8	67.2	5.0			22.7	1.6	6.8	10.9	9.3	7.4	22.3	19.0
44005	42.7N	068.3W		3.5	36.5	54.1	5.9			33.2	10.7	7.0	9.3	11.6	16.4	5.3	6.6
44007	43.5N	070.1W		8.1	47.9	43.2	0.7			25.4	14.4	11.1	10.2	12.7	14.2	5.7	6.3
44008	40.5N	069.4W		3.0	41.0	53.9	2.1			30.4	8.3	10.0	10.7	8.2	12.5	12.8	11.1
44009	38.5N	074.6W	3.2	6.0	50.6	41.0	2.3			7.6	11.5	12.0	12.6	17.4	12.7	13.9	12.2
44010	36.9N	075.7W		5.3	54.7	38.9	1.1			2.1	13.4	12.9	31.8	8.2	18.7	9.7	3.2
45002	45.3N	086.3W		9.5	56.9	32.1	1.5			7.6	32.7	11.7	3.1	13.9	20.6	6.1	4.1
45003	45.3N	082.8W		3.7	57.6	37.0	1.6			7.0	8.6	29.4	12.4	8.7	8.6	14.8	10.3
45007	42.7N	087.1W		3.5	46.0	47.1	3.3			26.6	13.2	18.6	11.1	9.2	7.5	4.4	9.4
45008	44.3N	082.4W		6.2	55.9	31.0	6.9				0.9	12.6	28.3	24.0	19.1	14.3	0.9
46001	56.3N	148.3W		4.9	38.2	53.1	3.8			11.8	9.3	5.7	12.1	12.9	15.2	18.2	14.8
46002	42.5N	130.3W		2.8	29.7	61.0	6.5			9.2	0.8	1.3	3.0	11.9	20.6	28.3	24.9
46003	51.9N	155.7W		3.0	21.9	60.3	14.8			6.9	3.6	3.9	11.8	12.1	20.5	16.0	25.2
46004	51.0N	136.0W		5.5	31.9	45.2	17.1	0.3		3.5	2.7	4.2	12.9	16.7	22.0	30.0	8.1
46006	40.7N	137.7W		5.4	23.2	46.0	25.1	0.3		7.7	4.7	0.5	2.2	15.5	23.7	30.8	15.0
46011	34.9N	120.9W		3.9	18.7	43.5	33.5	0.4		6.1	0.7	1.7	2.0	2.3	1.1	3.2	82.7
46012	37.4N	122.7W		4.2	27.0	42.6	24.1	2.2		17.6	1.3	0.8	3.2	3.8	1.6	9.0	62.8
46013	38.2N	123.3W		4.9	22.0	43.6	29.5			0.5	0.5	0.5	2.0	3.4	2.9	20.6	69.6
46014	39.2N	124.0W		9.2	31.9	45.7	13.2			17.3	1.5	2.5	8.9	2.1	2.5	5.1	60.1
46016	63.3N	170.3W		7.6	27.8	32.5	21.9	10.1		10.1	33.5	32.5	8.9	3.3	2.2	5.8	3.7
46017	60.3N	172.3W		8.2	37.3	45.0	9.5			32.5	27.8	10.3	3.3	2.2	14.5	5.9	4.4
46022	40.8N	124.5W		7.4	30.0	44.3	18.2			51.8	4.7	2.0	5.8	11.8	5.3	5.3	13.2
46023	34.3N	120.7W		0.3	6.0	29.9	60.4	3.4		5.4	0.1	1.8	1.9	2.8	1.0	1.7	85.2
46029	32.8N	119.5W			10.1	65.5	24.1	0.3							1.2	11.4	87.4
46025	33.6N	119.0W		19.0	42.4	31.2	7.5			5.0	2.4	3.7	5.1	4.7	5.6	43.4	30.2
46026	37.8N	122.7W		3.7	28.3	56.2	11.9			1.0	0.6	0.3	1.4	4.3	7.0	19.7	65.7
46028	35.8N	121.7W		3.4	17.9	47.9	30.7	0.1		1.3	1.3	2.6	3.2	0.1	0.2	4.0	87.3
46029	46.2N	124.2W		7.1	34.1	51.8	6.9	0.1		9.2	2.1	5.9	6.3	28.3	17.0	12.5	18.7
51001	23.4N	162.3W		0.6	11.7	87.4	0.3			1.6	18.6	73.7	2.5	1.5	2.0		0.1
BURL1	28.9N	089.4W	0.8	3.1	25.8	60.8	10.2	0.1		2.9	9.3	29.5	16.1	12.3	8.6	15.0	6.2
CSBF1	29.7N	085.4W	3.2	17.6	58.1	23.5	0.8			4.6	6.7	15.9	20.7	12.3	10.4	22.5	7.0
DBLN6	42.6N	079.5W	4.6	16.6	47.5	32.6	3.1	0.3		5.1	22.7	14.9	7.2	6.8	34.8	5.9	2.6
DISW3	47.1N	090.7W	2.4	7.9	47.5	34.4	10.1	0.1		16.1	38.8	11.9	2.6	3.5	18.5	3.6	5.1
GLLN6	43.5N	076.3W	1.4	8.4	57.9	30.9	2.7	0.1		15.2	21.9	12.0	12.8	5.7	8.7	14.2	9.6
NWP03	44.6N	124.1W	4.0	18.5	41.7	34.0	5.5	0.2		15.4	2.6	18.9	7.5	14.7	20.9	9.8	10.2
PTAT2	27.8N	097.1W	0.8	6.6	33.8	53.1	6.5			12.9	10.1	20.1	36.8	8.3	1.7	1.9	8.3
PTGC1	34.6N	120.7W			6.6	51.5	32.9	8.4	0.6	78.1							21.9
ROAM4	47.9N	084.3W	2.0	7.9	31.0	42.0	16.3	2.8		3.6	36.2	23.8	18.9	4.0	6.2	11.2	4.2
SBIO1	41.7N	082.8W	2.8	14.4	47.3	34.8	2.4	1.1		4.6	25.9	20.0	6.1	9.7	10.6	12.7	10.3
SISW1	48.3N	122.9W	3.6	13.1	45.2	31.8	9.7	0.1		1.4	3.5	6.2	30.2	12.5	8.5	29.7	8.0
SRST2	29.7N	094.1W	0.7	4.7	38.2	52.9	4.2			8.8	3.0	2.0	26.5	31.3	5.6	4.6	18.1
WPOW1	47.7N	122.4W	6.3	21.2	43.6	31.9	3.3			12.5	11.4	0.8	11.6	53.8	7.3	1.1	1.5

APRIL 1984

BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
			N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2	0.6	0.6	0.2	0.5	0.6	0.7	0.1	2.5	2.7	1.8	1.3	2.0	3.6	2.2	1.5	11.1	7.6	2.6	0.5	5.7	7.1	7.7	11.6
41002	32.3N	075.3W	1.3	0.8		1.4	0.3	1.0	1.1	0.5	3.3	8.9	3.8	2.0	5.3	4.4	4.8	2.6	1.0	3.8	2.2	5.0	10.0	11.0	17.7	5.7
41006	29.3N	077.7W	0.1	0.1		<.05	0.6	0.4	0.9	0.2	2.4	2.4	4.5	8.4	7.3	4.0	5.7	4.9	1.7	0.9	1.7	6.7	11.9	7.8	14.9	6.5
42001	25.9N	089.7W		1.9	0.8	0.4					2.1	3.4	3.7	5.1	3.8	2.6	0.4	0.5	3.7	4.3	5.9	25.2	6.7	0.4	1.7	7.5
42002	26.0N	093.5W	1.2		1.7		1.2	1.4	1.3	0.5	3.5	3.9	7.1	9.4	1.6	2.1	2.7	3.3	8.3	2.2	4.1	32.1	1.9		2.5	6.6
42003	26.0N	085.9W	0.2	<.05	0.2	0.7	0.6		0.1	1.1	2.9	3.2	4.9	2.4	0.5	0.3	1.2	2.7	2.9	2.5	11.4	26.4	9.4	1.3	1.8	7.0
42007	30.1N	088.9W		0.1	0.1	<.05		0.7	0.7	0.6	1.5	1.5	3.0	7.7	5.5	3.5	3.9	1.5	2.2	1.1	6.9	23.1	8.0	6.5	9.0	11.4
42008	28.7N	095.7W	0.1	0.2	0.5	0.9	1.1	0.6	0.1	0.4	2.3	8.2	3.1	1.1	5.5	3.1	1.6	3.6	6.8	1.2	6.8	18.3	14.2	1.8	1.2	8.3
42009	29.3N	087.5W	0.9	0.5	0.8	0.6	0.5	0.4	0.5	1.1	3.2	4.4	5.6	8.8	5.6	3.8	4.4	2.9	1.3	3.8	2.9	21.4	9.4	1.9	12.2	6.8
42011	29.6N	093.5W	0.4	0.1	0.6	<.05	1.1	0.7	0.8		1.2	0.1	0.2	4.4	4.6	3.8	1.9	2.0	7.0	1.9	1.9	16.0	29.7	8.1	1.6	8.8
44004	38.5N	070.7W	0.5	0.1	0.3	0.3	0.5	0.3	0.1	0.7	3.2	1.4	1.8	2.1	1.2	4.1	5.8	5.2	18.5	0.1	4.6	8.4	7.5	3.0	13.1	12.1
44005	42.7N	068.3W	0.2	0.2	0.1	0.4	0.3	0.6	1.2	0.5	4.3	4.0	1.9	2.7	7.6	9.3	2.8	3.9	25.4	6.3	4.5	4.9	3.7	6.5	1.3	1.7
44007	43.5N	070.1W	1.7	0.6	0.5	0.7	1.3	1.2	1.5	0.7	9.5	4.3	3.3	7.0	8.0	8.9	4.0	2.9	19.2	9.5	7.9	1.8	3.4	4.1	0.2	2.6
44008	40.5N	069.4W	0.1	0.3	0.4	0.5	0.6	0.4	0.4	0.3	7.4	3.1	3.9	3.2	4.7	7.9	5.6	5.3	22.0	0.8	5.5	6.1	2.9	4.3	6.8	5.5
44009	38.5N	074.6W	1.3	0.6	0.4	0.5	0.8	0.6	1.5	0.4	2.3	8.2	4.5	7.2	9.3	9.0	5.9	4.3	4.1	2.7	7.1	3.2	7.2	3.1	0.5	7.1
44010	36.9N	075.7W				2.4	0.8	1.1	0.8	0.3	2.1	1.3	11.3	7.4	4.2	17.6	7.9	2.9		12.1	1.6	21.1	3.2		1.1	
45002	45.3N	086.3W	2.5	1.3	0.4	0.4	1.0	0.7	0.6	2.7	5.2	17.7	8.2	2.8	5.4	12.9	3.2	1.4		13.6	3.1		7.4	7.1	0.8	
45003	45.3N	082.8W	0.8	0.8	0.3	0.1		0.5	0.7	0.4	3.9	4.8	16.9	4.8	3.6	6.5	8.6	8.6	2.3	3.0	12.2	7.5	5.1	0.6	4.8	1.4
45007	42.7N	087.1W	0.6	0.5	0.2	0.4	0.3	0.7	0.3	0.3	8.7	7.4	6.6	4.3	6.2	5.1	3.1	4.7	16.8	4.9	10.9	6.2	2.3	1.1	0.5	4.3
45008	44.3N	082.4W		0.7	1.2	0.9	0.7	2.4		1.2		0.2	8.6	16.1	14.7	5.5	11.9	0.9		2.0	13.1	7.4	5.3	2.4		
46001	56.3N	148.3W	0.7	1.1	0.2	0.3	0.3	0.7	0.8	0.7	6.7	2.0	1.7	2.6	6.9	7.0	5.0	6.4	4.4	6.2	1.9	8.9	5.7	7.4	11.0	7.7
46002	42.5N	130.3W				0.1	0.4	0.5	1.5	0.3	1.9	0.8	1.1	1.4	2.7	8.0	7.4	6.4	7.3		0.1	0.5	6.0	11.6	17.8	18.2
46003	51.9N	155.7W	0.6	0.8		0.1	0.6	0.5		0.2	2.1	0.9	0.7	3.1	1.6	4.3	3.9	5.3	0.6	0.8	1.2	6.1	9.9	15.6	10.0	16.0
46004	51.0N	136.0W	0.7	0.3	0.4	0.1	0.7	1.2	0.6	1.5	2.7	1.8	1.1	3.4	4.0	6.6	8.3	4.0	0.1	0.2	2.1	4.0	9.6	11.4	15.1	2.6
46006	40.7N	137.7W	1.3	0.9	0.2	0.2	1.0	0.6	0.2	0.9	3.6	2.0	0.2	1.3	4.4	5.9	5.0	2.8	2.8	1.8		0.7	6.4	10.7	14.4	9.3
46011	34.9N	120.9W	0.3	0.6	0.6	0.4	0.3	<.05	1.1	0.7	3.4	0.1	1.2	1.2	1.8	1.1	1.4	8.5	2.2			0.5	0.2		0.8	39.8
46012	37.4N	122.7W	0.1	0.2	0.5	0.5	0.2	0.4	1.2	1.1	4.2	1.1	0.3	1.4	1.2	1.2	6.5	11.0	8.9			1.0	1.6	<.05	1.3	29.7
46013	38.2N	123.3W	0.1	0.7	0.5	0.3	0.7	0.8	1.3	0.9	0.4	0.2		0.6	1.4	1.7	7.5	10.3				1.1	1.3	0.4	8.8	32.0
46014	39.2N	124.0W	2.7	0.6	1.6	0.4	0.7	0.4	0.6	2.2	8.7	0.9	0.9	3.0	1.2	1.8	3.4	11.2	4.5			4.6	0.3	0.3	1.1	34.9
46016	63.3N	170.3W	0.7	1.3	1.3	1.7	0.4	0.4	0.4	1.4	3.9	3.3	7.6	7.2	2.4	1.3	0.8	1.4	5.5	12.9	7.7		0.4	0.5	4.5	0.9
46017	60.3N	172.3W	2.4	1.6	1.4	0.1	0.3	0.9	0.5	1.0	16.5	5.2	1.8	0.9	0.3	6.5	3.2	2.8	13.3	16.0	5.0	1.3	1.5	7.2	2.3	0.6
46022	40.8N	124.5W	1.5	1.1	0.8	1.1	0.3	0.3	0.6	1.7	10.8	3.2	1.3	2.4	2.6	2.0	3.0	4.7	27.3	0.4		2.3	5.2	2.8	1.6	4.8
46023	34.3N	120.7W							0.1	0.1	0.2	<.05	0.6	0.8	2.7	0.6	0.3	0.5	1.6	0.1	0.7	1.0	1.1	0.5	1.3	24.7
46024	32.8N	119.5W														1.0	3.0	6.1						0.3	8.0	57.3
46025	33.6N	119.0W	1.8	0.7	1.5	1.3	2.6	2.4	4.8	4.0	2.8	1.4	1.9	2.4	2.1	3.2	16.8	11.6	0.4	0.3	0.3	1.3	<.05	18.3	10.6	
46026	37.8N	122.7W	0.4	0.2		0.2	0.2	1.0	0.8	0.8	0.6	0.3	0.1	0.2	1.8	5.8	11.2	8.2		0.1	0.1	1.0	2.1	0.2	7.5	45.0
46028	35.8N	121.7W	0.5	0.9	0.1	0.3		0.2	0.5	0.8	0.8	0.5	2.3	2.2	0.1	<.05	2.0	10.0			0.1	0.7			1.3	45.7
46029	46.2N	124.2W	0.3	0.4	1.8	0.8	0.8	1.7	1.2	0.2	1.2	1.7	2.9	2.4	5.8	6.1	7.6	6.5	7.7		1.3	1.3	16.8	8.9	3.8	12.0
51001	23.4N	162.3W			0.5	<.05					0.3	1.8	5.4	0.9	1.3	1.7		0.1	1.3	16.8	16.7	7.7	1.5	0.1	0.3	
BURL1	28.9N	089.4W		0.3	0.4	0.4	0.7	0.6	0.2	0.5	2.1	3.7	5.0	4.3	5.3	1.9	2.2	1.4	0.8	5.3	21.6	9.6	5.6	3.0	10.4	3.6
CSBF1	29.7N	085.4W	3.3	2.5	1.2	4.5	1.3	2.7	1.0	1.1	1.3	4.2	13.0	15.3	8.2	4.2	6.0	5.1			1.7	0.9	2.5	1.3	5.4	
DBLN6	42.6N	079.5W	1.4	4.1	3.2	1.3	1.9	1.9	1.8	0.9	2.1	11.9	9.3	3.4	3.3	13.3	2.8	1.4	1.6	6.6	2.4	2.5	1.5	16.3	1.1	1.4
DISW3	47.1N	090.7W	1.7	2.4	0.5	0.3	0.4	1.2	1.2	0.2	8.5	14.8	8.0	1.8	1.2	0.9	1.4	2.9	5.5	15.8	3.3	0.6	1.6	5.9	0.4	1.3
GLLN6	43.5N	076.3W	1.7	0.8	1.8	0.7	0.2	0.3	1.4	1.5	11.5	16.7	7.1	4.8	2.2	3.8	5.1	6.6	2.1	4.3	3.1	6.0	2.9	3.9	7.3	1.3
NWP03	44.6N	124.7W	1.0	1.6	7.3	3.5	0.6	0.7	2.1	1.7	3.8	1.0	10.9	3.9	5.5	6.8	4.9	5.0	6.5	0.1	0.7	7.5	11.4	2.5		3.4
PTAT2	27.8N	097.1W	0.9	0.8	1.4	0.5	0.5	0.6	0.4	1.4	3.7	5.6	10.3	7.2	1.5	1.1	0.7	3.7	7.7	3.2	8.0	25.0	5.1		0.8	3.1
PTGC1	34.6N	120.7W									6.6								43.3							8.2
ROAM4	47.9N	089.3W	0.5	2.0	1.5	0.7	0.6	0.7	0.8	1.1	1.4	7.4	9.2	3.4	2.7	1.7	3.2	2.2		10.7	10.2	4.9	0.4	1.6	5.1	0.8
SBI01	41.7N	082.8W	0.8	2.2	3.4	1.0	1.4	2.0	2.1	1.5	3.4	13.8	11.5	3.4	3.6	5.6	3.8	2.4	0.4	9.9	5.0	1.7	3.8	2.3	5.4	6.3
SISW1	48.3N	122.9W	0.7	1.6	0.9	0.7	2.7	2.6	2.5	1.4	0.4	1.6	4.0	9.3	7.0	4.9	14.1	4.0	0.3	0.3	1.3	11.0	2.1	2.1	1.0	12.5
SRST2	29.7N	094.1W	1.3	0.4	0.1	0.4	0.7	0.7		1.0	5.3	1.2	0.5	4.8	6.2	2.6	4.2	11.5	2.2	1.4	1.4	18.5	12.2	2.2	0.4	5.6
WPOW1	47.7N	122.4W	3.4	5.4	0.3	3.7	4.5	1.6	0.9	1.3	3.9	5.0	0.5	7.2	23.3	3.4	0.2	0.1	5.2	1.0		0.7	23.1	1.8		0.1

APRIL 1984

BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
			N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2			0.3	5.8	6.0	6.9	3.8						1.4	0.2	0.2								
41002	32.3N	075.3W		0.5	1.0	0.2	2.1	0.4	1.2	0.5																
41006	29.3N	077.7W				1.0	1.9	0.5	2.0	0.4																
42001	25.9N	089.7W	0.7			12.1	1.7		1.3	4.2																
42002	26.0N	093.5W				1.3																				
42003	26.0N	085.9W				4.9	3.0	1.2	2.0	5.0						0.1		0.1								
42007	30.1N	088.9W	0.2			0.6			0.1	0.5																
42008	28.7N	095.3W	1.2	0.5	0.4	3.1	1.3			1.0																
42009	29.3N	087.5W				0.7		0.4	0.3	0.8																
42011	29.6N	093.5W	1.9	0.6	0.2	4.8	3.1			1.9																
44004	38.5N	070.7W	0.5		0.1	<.05	0.1		3.2	0.9																
44005	42.7N	068.3W	3.3	0.3	0.6	1.3				0.5																
44007	43.5N	070.1W				0.7																				
44008	40.5N	069.4W	0.8		0.1	1.9				0.1																
44009	38.5N	074.6W				1.7	0.1			0.4																
44010	36.9N	075.7W				1.1																				
45002	45.3N	086.3W							1.5																	
45003	45.3N	082.8W						1.9	0.6																	
45007	42.7N	087.1W	0.5	0.4	0.9	0.1	0.3	0.7	0.4	0.1																
45008	44.3N	082.4W				0.2	1.2	5.5																		
46001	56.3N	148.3W		0.1	2.0	0.9		<.05	1.4																	
46002	42.5N	130.3W				1.0	2.8	1.1	1.6																	
46003	51.9N	155.7W	3.5	0.9	2.0	0.5			2.1	5.7																
46004	51.0N	136.0W		0.4	0.6	5.2	2.3	2.8	5.9					0.3												
46006	40.7N	137.7W					3.7	8.4	11.1	1.9						0.3	0.1									
46011	34.9N	120.9W	0.2							33.3								0.4								
46012	37.4N	122.7W	4.2			0.2	0.7			18.8								2.2								
46013	38.2N	123.3W							3.1	26.4																
46014	39.2N	124.0W	1.4							11.8																
46016	63.3N	170.3W		11.5	10.4							4.6	5.5													
46017	60.3N	172.3W	0.3	7.0	2.2																					
46022	40.8N	124.5W	12.1			0.1	3.9	0.1		1.9																
46023	34.3N	120.7W	3.5		0.3					56.7	0.1							3.3								
46024	32.8N	119.5W							0.4	23.7								0.3								
46025	33.6N	119.0W							3.4	4.0																
46026	37.8N	122.7W					0.1		0.1	11.6																
46028	35.8N	121.7W							0.1	30.6								0.1								
46029	46.2N	124.2W				1.9	4.8	0.3								0.1										
51001	23.4N	162.3W		0.3																						
BURL1	28.9N	089.4W			2.5	1.7	0.7	2.2	2.3	0.8				0.1												
CSBF1	29.7N	085.4W					0.2	<.05	0.6																	
DBLN6	42.6N	079.5W		0.1				2.9								0.3										
DISW3	47.1N	090.7W	0.5	5.8			0.2	2.3	0.7	0.7						0.1										
GLLN6	43.5N	076.3W				1.2	0.3	0.6	0.4	0.1						0.1										
NWP03	44.6N	124.1W	2.1				0.9	2.0	0.3	0.1																
PTAT2	27.8N	097.1W	0.5	0.5	0.3	4.1	1.1									0.2										
PTGC1	34.6N	120.7W	26.0							6.9	2.2							6.1								0.6
ROAM4	47.9N	089.3W	0.7	7.8	2.6	1.6	0.1	1.7	1.9	<.05	1.0	0.4	0.3	0.4	0.1	0.2	0.3	<.05								
SBI01	41.7N	082.8W			0.1	<.05	0.8	0.2	1.0	0.1					0.1	0.6	0.4									
SISW1	48.3N	122.9W				0.2	0.7		0.7	<.05				0.1												
SRST2	29.7N	094.1W				2.9	1.1	0.1																		
WPOW1	47.7N	122.4W					2.9	0.5																		

BUOY	LAT	LONG	AIR TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	SEA TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	AIR-SEA TEMPERATURE DIFFERENCE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
MAY 1984																							
41001	34.9N	072.9W	739	31	23.9	05 01	12.7	17 02	21.1	742	31	24.8	25 21	21.2	21 03	22.7	742	31	02.1	20 09	-09.6	17 02	-01.6
41002	32.3N	075.3W	206	11	25.2	26 00	20.3	31 22	23.9	206	11	26.2	26 19	24.1	02 17	25.3	491	23	-00.2	28 12	-04.5	31 22	-00.9
41006	29.3N	077.3W	741	31	25.8	05 18	20.2	18 12	23.7	741	31	26.1	07 20	23.5	03 06	24.6	741	31	00.9	15 16	-04.1	24 20	-00.9
42001	25.9N	089.7W	372	31	26.1	08 17	19.8	23 03	24.6	372	31	27.5	28 21	24.3	10 09	25.6	402	31	00.9	07 03	-06.4	30 21	-01.0
42002	26.0N	093.5W	353	31	26.0	22 21	20.6	16 21	24.3	353	31	26.3	27 21	23.1	01 13	24.2	353	31	01.9	06 11	-04.1	31 06	00.0
42003	26.0N	085.9W	741	31	29.6	07 06	25.0	22 19	28.2	741	31	28.8	28 21	26.0	19 04	26.9	741	31	02.7	04 03	-01.8	11 21	01.4
42007	30.1N	088.9W	739	31	28.2	27 16	14.6	30 11	23.6	734	31	29.1	29 00	22.6	03 09	24.5	739	31	01.9	06 17	-09.8	30 11	-00.9
42008	28.7N	095.3W	738	31	28.3	28 14	19.4	30 18	23.5														
42009	29.3N	087.5W	737	31	27.6	28 21	16.2	30 12	23.6	737	31	28.5	28 22	22.2	03 12	24.5	738	31	01.5	03 12	-08.7	30 12	-00.9
42011	29.6N	093.5W	739	31	28.5	28 17	16.8	30 12	23.5														
44004	38.5N	070.7W	027	02	17.4	01 09	14.5	01 14	15.7	027	02	16.4	01 09	15.6	02 00	16.1	027	02	01.0	01 09	-01.4	01 14	-00.4
44005	42.7N	068.3W	742	31	12.4	26 21	04.9	17 13	08.8	742	31	09.4	25 21	05.4	01 08	07.2	742	31	04.3	27 01	-02.0	17 13	01.6
44007	43.5N	070.1W	342	16	18.3	26 23	06.9	17 10	11.1														
44008	40.5N	069.4W	729	31	16.3	30 20	05.9	07 14	10.5	729	31	12.4	31 20	05.6	02 10	07.9	730	31	06.7	04 19	-02.1	07 19	02.6
44009	38.5N	074.6W	720	31	21.7	20 06	08.6	17 09	14.3	719	31	17.2	24 20	10.1	01 00	12.8	734	31	09.9	20 06	-03.9	31 10	01.5
44010	36.9N	075.7W	734	31	22.5	26 20	10.5	17 13	16.9	734	31	20.6	24 22	12.6	30 19	16.0	734	31	05.4	04 21	-04.4	17 12	00.9
44011	41.1N	066.6W	197	09	15.7	31 19	09.3	28 02	11.9	197	09	10.4	28 20	07.2	26 11	08.5	197	09	06.9	31 19	00.8	28 06	03.5
45001	48.0N	087.6W	500	21	09.2	18 23	01.9	12 10	04.1	500	21	02.8	28 20	01.7	11 02	02.1	500	21	07.2	18 23	-00.1	28 10	02.0
45002	45.3N	086.3W	734	31	09.4	12 00	01.1	01 14	04.6	734	31	03.2	29 21	01.9	01 00	02.6	734	31	06.9	12 00	-00.8	01 14	02.0
45003	45.3N	082.8W	738	31	08.5	22 07	00.8	03 07	04.2	739	31	02.5	31 18	01.4	03 09	02.0	739	31	06.4	22 07	-00.7	02 02	02.3
45005	0.0N	000.0W	386	17	19.6	25 22	07.3	16 08	12.8	386	17	15.4	24 23	10.3	16 07	12.3	386	17	07.2	18 23	-05.6	29 14	00.5
45006	47.3N	090.0W	485	21	09.7	18 22	02.5	14 02	05.1	489	21	03.1	29 16	01.5	15 09	02.3	489	21	07.4	18 22	00.3	20 18	02.8
45007	42.7N	087.1W	741	31	14.3	18 22	02.2	02 11	05.5	741	31	03.5	31 19	02.0	01 07	02.7	741	31	11.3	18 22	00.0	02 11	02.8
45008	44.3N	082.4W	737	31	10.7	26 00	01.0	13 15	04.8	739	31	03.7	27 16	01.4	01 00	02.4	739	31	07.8	26 00	-01.1	13 15	02.4
46001	56.3N	148.3W	735	31	08.7	29 19	02.8	01 16	06.1														
46002	42.5N	130.3W	743	31	13.7	28 20	08.6	07 00	10.9	743	31	13.4	28 21	10.8	08 12	11.5	743	31	01.2	22 10	-02.7	07 00	-00.7
46003	51.9N	155.7W	248	31	07.2	29 03	01.4	03 18	04.9	248	31	07.0	29 00	04.5	03 15	05.4	248	31	01.1	08 12	-03.2	03 18	-00.5
46004	51.0N	136.0W	734	31	09.6	27 01	04.8	04 06	07.9	734	31	09.9	27 00	07.7	01 08	08.6	734	31	00.8	07 19	-03.3	04 06	-00.7
46005	46.1N	131.0W								721	31	11.3	27 02	07.7	13 16	10.0							
46006	40.7N	137.7W	547	24	14.1	27 22	08.9	11 16	11.4	547	24	14.3	31 23	12.5	10 12	13.0	741	31	00.9	19 01	-04.2	26 12	-01.2
46011	34.9N	120.9W	739	31	16.0	27 22	09.2	01 15	11.7	739	31	16.3	31 22	10.0	05 13	11.5	739	31	03.3	07 16	-03.2	29 11	00.2
46012	37.4N	122.7W	738	31	16.6	20 19	10.6	01 08	12.0	739	31	13.6	03 02	09.8	25 11	11.4	740	31	05.1	20 19	-01.6	18 20	00.6
46013	38.2N	123.3W	736	31	13.9	11 22	09.6	06 13	11.1	735	31	12.5	03 19	08.1	25 23	09.5	736	31	03.3	08 03	-00.7	04 03	01.6
46014	39.2N	124.0W	738	31	17.0	29 02	09.4	16 15	11.9	738	31	15.8	29 00	10.2	21 12	12.0	738	31	03.2	29 02	-02.1	01 12	-00.1
46016	63.3N	170.3W	050	16	03.1	18 00	00.1	15 18	01.0														
46017	60.3N	172.3W	082	21	04.6	31 21	00.1	06 21	00.7														
46022	40.8N	124.5W	734	31	15.3	22 23	08.8	05 15	11.7	734	31	14.1	23 01	09.3	31 18	11.9	735	31	02.4	31 23	-02.3	05 15	-00.2
46023	34.3N	120.7W	736	31	16.7	27 20	10.2	01 17	12.6	736	31	18.2	28 22	10.4	05 12	12.8	736	31	03.3	07 18	-04.0	29 04	-00.2
46024	32.8N	119.5W	735	31	18.8	08 19	11.4	15 13	13.8	078	04	14.7	03 21	10.5	04 08	14.2	735	31	04.5	08 19	-02.9	15 13	-00.4
46025	33.6N	119.0W	741	31	18.7	26 00	13.1	15 14	16.0	740	31	19.5	21 23	14.9	05 06	17.2	741	31	01.6	04 00	-04.3	13 10	-01.2
46026	37.8N	122.7W	735	31	14.7	28 17	08.7	06 13	10.8	733	31	12.9	03 02	08.5	06 12	10.4	735	31	02.9	23 04	-02.0	06 17	00.5
46028	35.8N	121.7W	743	31	14.1	28 02	09.6	01 11	11.3	743	31	13.1	30 11	09.5	07 08	10.7	743	31	02.2	11 15	-02.3	29 09	00.6
46029	46.2N	124.2W	733	31	16.0	28 21	07.7	05 15	10.9	733	31	15.1	17 01	10.1	05 14	11.9	733	31	02.6	28 15	-03.4	06 01	-01.0
51001	23.4N	162.3W	739	31	25.6	06 03	22.6	17 16	24.6	739	31	27.3	12 04	24.3	06 17	25.3	739	31	00.2	06 03	-02.9	31 01	-00.7
BURL1	28.9N	089.4W	736	31	29.8	28 23	17.0	30 12	23.2														
CSBF1	29.7N	085.4W	721	31	27.5	28 16	15.8	30 08	23.3														
DBLN6	42.6N	079.5W	738	31	26.4	25 22	03.2	02 09	10.0														
DISW3	47.1N	090.7W	732	31	18.9	17 22	00.0	01 06	06.6														
FBIS1	32.7N	079.9W	247	11	25.7	22 18	11.9	31 10	22.6														
GLLN6	43.5N	076.3W	739	31	18.0	07 17	03.1	02 17	07.6														
NWPO3	44.6N	124.1W	001	01	99.9	00 00	09.3	01 00	09.3														
PILM4	48.2N	088.4W	332	15	11.7	18 01	02.5	28 10	05.7														
PTAT2	27.8N	097.1W	737	31	31.0	20 23	19.4	30 12	23.9														
PTGC1	34.6N	120.7W	730	31	22.5	08 03	08.5	19 13	12.1														
ROAM4	47.9N	089.3W	726	31	12.7	30 14	00.0	01 00	04.7														
SBIO1	41.7N	082.8W	741	31	23.6	18 22	05.1	14 08	12.0														
SGNW3	43.8N	087.7W	675	30	23.3	18 19	03.1	03 13	09.4														
SISW1	48.3N	122.9W	737	31	17.3	07 23	07.0	03 11	10.1														
SJLF1	30.4N	081.4W	150	07	27.3	28 17	14.4	31 10	23.0														
SRST2	29.7N	094.1W	731	31	30.7	03 23	14.8	09 09	23.2														
WPOW1	47.7N	122.4W	739	31	21.6	07 23	06.0	03 12	10.6														

BUOY	LAT	LONG	PRESSURE (MB) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	WIND SPEEDS (KNOTS) OBS	MAX	DY HR	DIR	MEAN WIND SPEED (KNOTS) N	NE	E	SE	S	SW	W	NW	TOTAL
MAY 1984																						
41001	34.9N	072.9W	742	31	1026.6	28 03	1003.2	04 19	1018.3	739	35	04 18	220	17.7	14.1	9.0	17.4	18.1	16.1	10.3	14.4	16.2
41002	32.3N	075.3W	206	11	1025.5	28 04	1006.3	31 11	1019.2	206	31	31 10	180	18.0	2.0	2.0	13.9	15.6	14.1	8.8	13.4	14.7
41006	29.3N	077.3W	741	31	1024.6	18 16	1009.1	31 08	1018.7	738	27	31 00	180	13.3	8.6	9.3	12.7	10.5	10.2	8.6	13.5	10.9
42001	25.9N	089.7W	372	31	1021.0	18 18	1005.3	03 23	1014.7	372	28	03 11	180	19.6	15.7	12.7	17.4	19.3			7.0	16.2
42002	26.0N	093.5W	353	31	1023.6	09 15	1004.2	03 11	1013.7	353	27	09 00	010	17.0	15.8	10.8	13.8	12.7	3.5		3.7	13.3
42003	26.0N	085.9W	741	31	1021.9	18 16	1007.5	03 21	1016.1	741	30	03 16	180	16.3	13.3	12.9	15.3	18.6	10.0	6.9	7.2	14.4
42007	30.1N	088.9W	739	31	1024.0	18 16	1001.2	03 23	1016.8	724	27	30 09	030	11.8	14.3	11.3	11.1	11.2	9.7	6.4	7.2	11.2
42008	28.7N	095.3W	742	31	1025.2	09 15	1001.8	03 10	1014.9	741	33	08 10	360	19.4	14.5	12.4	13.4	14.3	11.9	9.3	15.1	13.8
42009	29.3N	087.5W	737	31	1023.6	18 15	1003.5	04 00	1016.7	712	27	22 18	020	16.2	10.7	7.9	9.8	11.0	8.9	6.4	6.9	10.2
42011	29.6N	093.5W	741	31	1024.7	30 14	1001.2	03 09	1015.4	738	35	22 23	110	16.9	16.1	13.9	14.6	15.1	13.2	12.5	7.8	14.8
44004	38.5N	070.7W	027	02	1015.7	02 02	1009.2	01 09	1012.9	027	22	01 09	240					15.4	17.7	14.8	13.0	15.1
44005	42.7N	068.3W	742	31	1026.5	28 21	991.2	05 04	1013.8	737	23	04 13	100	8.9	8.3	11.9	11.1	11.6	10.4	9.7	6.0	10.4
44007	43.5N	070.1W	665	31	1027.0	28 17	1002.1	05 17	1013.8	707	24	04 13	080	8.5	9.3	11.5	8.4	13.1	10.0	9.2	9.1	10.4
44008	40.5N	069.4W	729	31	1025.6	28 04	993.3	05 00	1015.0	727	24	09 04	220	11.2	7.8	10.0	10.8	13.1	10.6	8.5	6.1	10.4
44009	38.5N	074.6W	715	31	1025.5	28 02	993.4	04 20	1016.0	720	29	09 00	300	11.5	8.7	9.0	8.4	15.4	10.9	10.1	12.6	12.2
44010	36.9N	075.7W	734	31	1025.1	18 03	994.6	04 18	1016.2													
44011	41.1N	066.6W	197	09	1026.2	28 12	1010.6	24 09	1020.3	196	18	31 19	170	5.5	5.2	6.1	9.4	11.2	9.8	7.6	4.3	08.8
45001	48.0N	087.6W	500	21	1033.6	28 16	997.6	24 23	1015.7	495	15	12 06	310	6.0	5.7	4.9	8.0	7.8	8.1	6.9	7.1	07.2
45002	45.3N	086.3W	734	31	1030.2	16 13	999.1	25 16	1013.9	728	26	01 00	270	7.8	7.5	8.1	5.5	9.4	8.7	8.4	7.6	08.3
45003	45.3N	082.8W	739	31	1028.4	16 15	999.1	01 00	1013.5	728	27	01 00	250	8.8	8.9	7.4	8.1	8.7	6.4	10.0	9.6	08.8
45005	0.0N	000.0W	386	17	1028.8	17 13	1005.2	25 22	1017.0	379	18	28 17	060	7.3	10.6	8.1	5.3	6.7	6.8	5.8	6.9	07.1
45006	47.3N	090.0W	489	21	1034.2	28 17	999.1	24 23	1016.8	478	17	24 21	230	5.7	6.9	5.9	6.0	6.1	8.8	7.5	6.4	07.2
45007	42.7N	087.1W	741	31	1031.7	16 16	1000.1	03 22	1015.4	726	19	01 00	260	9.3	8.8	5.4	7.3	7.7	7.1	8.4	7.3	07.8
45008	44.3N	082.4W	739	31	1028.7	16 15	998.9	04 09	1014.0	737	27	01 00	240	8.6	9.4	7.0	7.8	8.8	7.7	7.8	8.0	08.1
46001	56.3N	148.3W	735	31	1026.9	06 21	994.0	17 20	1009.9	721	20	08 00	040	5.2	11.2	12.4	9.7	7.0	8.1	7.5	5.8	08.7
46002	42.5N	130.3W	743	31	1031.4	31 19	1000.3	01 14	1019.7	728	27	01 20	270	9.2	5.5	9.7	15.4	12.6	11.7	12.1	11.1	11.4
46003	51.9N	155.7W	248	31	1024.4	30 00	983.7	17 15	1011.2	248	25	14 03	150	12.1	10.9	11.5	12.7	12.0	9.9	11.3	11.9	11.4
46004	51.0N	136.0W	734	31	1027.6	26 22	983.6	22 16	1011.8	731	31	07 12	100	8.0	13.2	17.4	15.2	11.8	11.9	12.8	10.1	12.8
46005	46.1N	131.0W	739	31	1031.7	31 23	992.7	01 14	1016.9													
46006	40.7N	137.7W	668	31	1034.7	31 17	1006.8	07 01	1020.5	737	33	01 10	270	11.8	9.5	15.8	18.2	17.0	18.0	18.5	13.6	16.1
46011	34.9N	120.9W	739	31	1021.3	02 19	1010.4	26 02	1015.2	642	29	15 03	310	6.4	3.5	3.7	3.1	4.8	3.8	3.7	17.0	15.8
46012	37.4N	122.7W	738	31	1022.7	18 18	1010.6	28 01	1017.7	738	36	15 06	320	14.4	2.4	2.7	4.2	8.9	3.7	4.7	16.1	14.3
46013	38.2N	123.3W	736	31	1023.8	18 17	1011.9	28 02	1018.6	725	30	14 22	300	7.0		1.7	6.7	5.0	6.4	13.4	19.1	16.4
46014	39.2N	124.0W	738	31	1023.1	08 18	1010.8	28 04	1018.4													
46016	63.3N	170.3W	245	31	1028.1	08 00	1006.3	16 00	1015.6	244	28	19 00	070	10.0	14.6	10.9	6.6	7.3	12.9	11.6	9.8	11.1
46017	60.3N	172.3W	238	31	1030.2	08 09	1000.3	16 03	1014.6	228	37	22 12	060	9.8	11.0	12.5	9.5	10.7	7.8	7.5	5.9	10.0
46022	40.8N	124.5W	734	31	1026.9	23 20	1009.6	01 18	1020.1	720	30	01 19	190	13.0	5.4	2.9	3.8	14.5	8.6	5.1	11.4	11.8
46023	34.3N	120.7W	736	31	1020.6	02 18	1009.4	26 02	1014.9	716	37	14 20	320	15.6	5.5	4.7	3.9	5.6	5.6	6.1	23.8	21.9
46024	32.8N	119.5W	735	31	1019.1	01 19	1008.5	06 02	1013.5	716	34	15 07	310	4.9	2.9	3.5	4.2	3.7	4.0	9.6	17.4	14.1
46025	33.6N	119.0W	740	31	1017.9	01 19	1007.0	05 03	1012.7	727	24	04 03	290	4.0	3.3	4.0	4.7	3.8	4.3	9.3	10.5	07.0
46026	37.8N	122.7W	735	31	1023.1	02 20	1011.1	28 02	1017.7	729	28	15 02	300	2.5	2.5	2.0	2.4	7.5	4.8	10.6	16.3	13.7
46028	35.8N	121.7W	743	31	1022.8	02 19	1010.9	27 04	1017.1	740	33	25 02	310	11.6		1.9	4.8	3.2	2.3	9.6	20.8	19.3
46029	46.2N	124.2W	733	31	1028.9	31 19	993.8	01 19	1018.5	726	26	25 22	160	10.1	7.1	8.8	9.0	13.1	10.9	8.6	9.6	10.3
51001	23.4N	162.3W	739	31	1024.2	19 21	1015.4	05 03	1019.4	735	19	20 08	070	2.9	8.8	10.7	7.4				2.6	10.1
BURL1	28.9N	089.4W								736	28	22 17	020	15.3	8.3	10.6	13.7	13.4	5.9	4.4	10.1	11.5
CSBF1	29.7N	085.4W	735	31	1025.5	18 15	1005.5	04 01	1017.8	737	21	03 15	170	5.5	3.5	4.6	4.9	7.5	6.1	6.4	3.2	05.7
DBLN6	42.6N	079.5W	740	31	1029.3	17 15	990.4	04 12	1014.6	739	33	01 14	230	10.7	13.2	7.6	7.4	6.2	13.6	8.4	9.2	11.1
DISW3	47.1N	090.7W	477	21	1033.0	28 16	998.5	24 22	1011.8	737	28	11 21	270	8.0	6.9	6.7	6.1	8.5	12.5	14.4	10.8	09.8
FBIS1	32.7N	079.9W	247	11	1022.8	22 16	1012.6	30 10	1018.0	247	20	30 18	360	10.8	11.3	12.6	7.2	9.5	9.6	6.0	4.7	09.7
GLLN6	43.5N	076.3W	739	31	1027.4	17 15	991.2	04 17	1013.4	738	31	01 01	260	7.2	11.5	6.0	9.6	12.0	10.1	12.8	8.1	10.9
NWPO3	44.6N	124.1W	406	24	1020.8	07 07	1002.7	02 01	1017.1	702	39	01 17	200	11.2	2.5	3.4	3.1	14.6	13.9	9.2	7.4	09.3
PILM4	48.2N	088.4W	338	15	1033.2	28 19	996.2	24 23	1013.9	332	29	19 00	250	6.5	7.6	9.2	8.5	12.7	11.6	10.2	5.8	09.5
PTAT2	27.8N	097.1W	737	31	1024.7	08 16	1000.4	05 22	1013.0	737	35	08 09	360	17.1	12.5	11.2	13.4	14.2	10.5	6.4	8.4	12.9
PTGC1	34.6N	120.7W								730	41	15 06	340	18.7	2.5	2.0	1.7	7.8	1.9	3.1	16.8	17.7
ROAM4	47.9N	089.3W	740	31	1033.3	28 15	997.5	24 23	1013.8	739	31	09 01	010	14.5	13.0	6.4	11.3	9.1	14.0	13.1	12.2	12.3
SBIO1	41.7N	082.8W	740	31	1030.1	16 15	996.4	04 07	1015.9	740	37	19 02	310	8.2	8.9	7.5	7.3	10.8	12.7	13.6	12.9	11.1
SGNW3	43.8N	087.7W	732	31	1030.9	16 15	999.1	25 15	1014.4	669	30	13 12	150	10.9	7.8	5.9	6.2	9.8	7.7	10.8	10.8	09.5
SISW1	48.3N	122.9W	737	31	1029.3	27 14	993.3	02 02	1017.4	735	31	02 09	270	3.7	4.4	7.9	11.4	5.7	6.0	10.7	4.7	08.7
SJLF1	30.4N	081.4W								149	21	29 01	160	12.9	12.0	10.6	11.7	12.9	1.8	7.0	12.3	11.8
SRST2	29.7N	094.1W	738	31	1024.7	30 14	1000.5	03 21	1014.8	738	35	23 00	110	9.6	7.4	12.4	13.5	13.4	14.8	3.7	4.4	12.2
WPOW1	47.7N	122.4W	739	31	1028.7	27 14	995.4	01 23	1017.4	739	25	02 10	210	5.3	4.8	4.3	5.4	9.9	8.9	2.5	2.0	07.9

MAY 1984			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)						
BUOY	LAT	LONG	OBS	MAX	DY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	739	5.5	04	20	1.9	2.0	52.3	28.4	9.4	7.7			
41002	32.3N	075.3W	162	2.5	24	06	1.7		53.7	46.2					
41006	29.3N	077.3W	740	3.5	31	12	1.5	2.1	66.8	29.4	1.4				
42001	25.9N	089.7W	372	3.0	03	12	1.4	13.7	55.9	28.2	2.1				
42002	26.0N	093.5W	351	3.5	09	06	1.4	3.1	62.1	33.9	0.8				
42003	26.0N	085.9W	741	3.0	03	12	1.1	24.9	66.9	13.4	0.5				
42007	30.1N	088.9W	256	1.5	03	09	0.6	79.2	20.7						
42009	29.3N	087.5W	171	3.0	03	20	1.3	9.3	69.5	19.8	1.1				
44005	42.7N	068.3W	741	3.0	05	07	1.4	5.3	67.2	25.7	1.6				
44007	43.5N	070.1W	371	6.0	19	23	1.0	38.0	51.4	8.6	1.6		0.2		
44008	40.5N	069.4W	716	4.0	01	00	1.4	8.5	70.3	16.6	3.9	0.5			
44010	44.9N	075.7W	721	2.0	31	04	0.8	46.8	51.8	1.2					
44011	41.1N	066.6W	197	4.0	31	23	1.4	3.5	67.0	26.9	2.0	0.5			
45001	48.0N	087.6W	407	2.0	12	09	0.7	64.8	34.8	0.2					
45002	45.3N	086.3W	541	3.5	01	01	0.7	68.2	26.2	4.8	0.7				
45003	45.3N	082.8W	253	4.0	01	00	0.8	66.7	21.7	7.9	2.7	0.7			
45005	0.0N	000.0W	222	2.0	24	19	0.7	68.9	23.8	4.0	3.1				
45006	47.3N	090.0W	315	2.0	24	19	0.6	75.2	24.1	0.6					
45007	42.7N	087.1W	475	3.0	01	01	0.7	64.6	32.8	2.1	0.4				
45008	44.3N	082.4W	620	4.0	01	00	0.7	65.0	31.1	2.5	0.9	0.3			
46001	56.3N	148.3W	733	6.0	08	08	1.8	2.4	63.5	14.7	14.3	4.7	0.1		
46003	51.9N	155.7W	248	4.5	08	03	2.1		48.7	27.8	16.9	6.8	1.6		
46004	51.0N	136.0W	734	8.0	07	14	2.6		30.9	33.1	13.8	19.2	2.8	0.2	
46005	46.1N	131.0W	739	8.5	22	19	2.5		29.6	37.7	17.3	12.8	2.0	0.4	
46006	40.7N	137.7W	737	6.5	08	09	2.4		32.9	36.9	13.8	14.2	2.0		
46011	34.9N	120.9W	160	4.0	06	04	2.1		31.8	46.2	20.0	1.8			
46012	37.4N	122.7W	737	4.5	15	03	2.0	5.5	36.6	32.8	20.8	4.0			
46013	38.2N	123.3W	736	4.5	09	19	2.3	2.0	27.5	39.6	22.1	8.5			
46014	39.2N	124.0W	736	5.0	31	23	2.1	4.0	36.8	29.6	22.4	7.0			
46022	40.8N	124.5W	734	5.0	31	06	2.0	3.8	37.1	35.6	19.7	3.9			
46023	34.3N	120.7W	736	5.5	15	02	2.5		22.6	35.5	26.4	15.2			
46025	33.6N	119.0W	739	3.5	15	02	1.5	5.2	65.7	25.5	3.3				
46026	37.8N	122.7W	731	3.5	10	04	1.7	7.6	46.3	36.9	9.0				
46029	46.2N	124.2W	732	5.0	23	09	2.0	1.6	43.3	32.2	15.9	6.8			
51001	23.4N	162.3W	739	3.0	01	16	1.8		47.4	51.5	0.9				

MAY 1984			TOTAL FREQUENCY OF WIND SPEEDS (%)						TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		4.5	18.0	54.4	22.9	0.3		11.2	2.1	1.1	8.4	26.5	30.9	7.3	12.5
41002	32.3N	075.3W		1.0	11.7	81.1	6.3			3.3	0.1	0.4	33.1	51.3	6.2	2.9	2.7
41006	29.3N	077.3W		4.9	41.3	53.0	0.8			8.6	14.0	3.9	23.8	29.5	14.6	3.6	2.0
42001	25.9N	089.7W			13.4	65.3	21.2			4.8	14.6	26.1	44.5	9.7			0.3
42002	26.0N	093.5W		2.0	23.5	70.0	4.5			2.5	15.0	20.4	45.8	15.3	0.6		0.4
42003	26.0N	085.9W		0.7	23.2	67.6	8.5			6.4	20.9	28.0	33.4	8.7	1.5	0.6	0.5
42007	30.1N	088.9W		7.3	41.2	47.7	3.9			9.2	12.4	8.9	28.1	28.7	6.9	3.3	3.1
42008	28.7N	095.3W		1.8	21.1	72.3	4.9			6.7	9.9	21.4	42.1	15.1	3.6	0.6	0.5
42009	29.3N	087.5W		10.1	47.6	38.9	3.4			10.5	17.6	16.6	34.4	13.4	4.8	3.7	4.0
42011	29.6N	093.5W	0.1	2.6	21.0	64.6	11.7	0.1		6.5	11.2	8.2	19.3	39.9	12.8	1.3	0.8
44004	38.5N	070.7W			7.4	88.9	3.7							19.4	17.6	43.5	19.4
44005	42.7N	068.3W		10.2	38.0	48.2	3.7			4.1	1.2	4.7	7.7	29.3	25.5	19.1	8.4
44007	43.5N	070.1W		7.8	44.7	46.7	0.8			9.7	6.7	6.5	6.9	25.1	16.7	18.0	10.5
44008	40.5N	069.4W		7.2	41.5	51.0	0.3			4.9	1.3	3.6	11.6	25.4	23.7	21.7	7.8
44009	38.5N	074.6W	3.3	5.7	37.9	53.2	3.2			7.5	5.6	7.2	6.7	33.3	13.0	9.0	17.7
44011	41.1N	066.6W		8.7	57.7	33.7				2.6	5.9	4.3	25.0	19.3	21.9	17.1	4.0
45001	48.0N	087.6W		8.5	76.9	15.2				7.5	6.7	3.2	11.5	10.4	21.1	21.2	18.4
45002	45.3N	086.3W		7.1	46.0	47.5	0.5			12.5	6.9	5.4	6.8	25.0	20.4	14.5	9.7
45003	45.3N	082.8W		6.6	65.8	27.2	0.4			4.8	5.0	10.3	8.7	16.0	10.6	27.3	17.2
45005	0.0N	000.0W		14.0	72.0	14.0				4.3	11.5	11.7	4.2	10.5	20.2	22.9	14.8
45006	47.3N	090.0W		11.9	74.3	13.8				4.6	12.9	9.3	7.3	7.6	26.6	21.5	10.3
45007	42.7N	087.1W		10.2	67.5	22.3				12.6	7.1	4.1	12.1	23.3	14.9	13.7	12.5
45008	44.3N	082.4W		7.5	68.8	22.9	0.8			9.3	7.2	5.2	10.3	18.2	17.0	18.4	14.5
46001	56.3N	148.3W		9.0	62.3	28.7				6.6	11.2	18.3	6.1	8.4	22.8	17.1	9.6
46002	42.5N	130.3W		6.6	37.0	54.1	2.3			9.9	3.5	2.7	4.1	16.1	18.1	24.0	21.5
46003	51.9N	155.7W		1.6	44.8	50.8	2.8			13.3	5.7	4.5	6.1	8.4	18.9	31.6	11.5
46004	51.0N	136.0W		4.4	31.1	55.5	9.0			2.2	1.7	7.3	18.0	20.8	22.5	18.6	9.0
46006	40.7N	137.7W		1.6	19.1	55.5	23.7			8.5	4.5	2.6	1.8	15.5	23.6	25.3	20.1
46011	34.9N	120.9W		3.9	16.0	64.3	15.8			3.7	0.1	0.6	0.4	0.9	2.0	2.0	90.5
46012	37.4N	122.7W		4.9	27.9	50.3	16.7	0.3		22.2	0.7	0.4	1.4	6.9	2.5	2.8	63.1
46013	38.2N	123.3W		5.1	17.9	48.6	28.4			0.1		0.7	3.9	3.9	1.4	23.0	67.0
46016	63.3N	178.3W		9.0	41.4	44.7	4.9			9.7	13.9	37.4	5.9	4.3	4.4	17.0	7.3
46017	60.3N	172.3W		9.2	48.7	41.2		0.9		20.0	21.5	19.8	8.1	6.0	14.1	8.4	2.0
46022	40.8N	124.5W		9.6	37.8	45.0	7.6			60.6	3.2	1.7	5.2	10.7	7.8	1.7	12.0
46023	34.3N	120.7W		2.4	9.9	27.8	56.6	3.4		6.7	0.8	0.8	0.9	1.9	0.9	2.1	86.4
46024	32.8N	119.5W		10.1	22.8	48.6	18.4	0.1		2.0	2.2	3.7	2.0	2.5	2.7	15.9	69.1
46025	33.6N	119.0W		26.5	53.6	17.5	2.3			2.9	2.5	6.7	11.8	11.6	13.0	35.5	16.0
46026	37.8N	122.7W		6.3	25.8	56.9	11.0			0.5	0.1	0.1	0.6	7.0	4.5	22.0	65.2
46028	35.8N	121.7W		3.5	9.5	39.1	48.0			1.2		0.2	1.7	1.8	0.4	4.0	89.3
46029	46.2N	124.2W		9.6	40.1	47.9	2.3			18.6	1.8	4.8	5.0	19.4	22.4	18.7	17.4
51001	23.4N	162.3W		2.4	48.2	49.4				0.7	12.7	79.1	7.1				0.3
BURL1	28.9N	089.4W	1.6	7.7	42.3	42.4	7.6			14.9	15.0	29.7	24.9	5.8	4.1	1.8	3.8
CSBF1	29.7N	085.4W	5.8	28.1	62.8	9.1				11.5	9.0	5.0	25.7	27.0	9.3	8.3	4.2
DBLN6	42.6N	079.5W	2.2	8.7	43.8	38.8	8.7			4.0	10.8	4.2	5.0	14.4	47.5	9.4	4.8
DISW3	47.1N	090.7W	3.7	12.2	46.3	35.9	2.6			5.5	16.5	14.8	6.3	9.1	30.3	11.4	6.2
FBIS1	32.7N	079.9W	1.9	4.9	51.8	43.3				17.8	4.9	4.3	3.8	48.9	16.7	2.4	1.2
GLLN6	43.5N	076.3W	0.8	8.8	41.2	46.2	3.8			9.2	4.4	2.3	7.8	22.1	23.2	26.5	4.5
NWP03	44.6N	124.1W	6.3	19.1	42.2	32.3	6.1	0.3		16.2	3.6	14.5	4.8	8.0	22.6	11.8	18.4
PILM4	48.2N	088.4W	1.2	10.5	54.2	32.5	2.7			13.3	7.8	8.5	10.0	15.4	14.8	22.0	8.4
PTAT2	27.8N	097.1W	0.8	1.6	28.8	66.9	2.0	0.1		7.6	4.6	13.2	44.1	8.4	8.7	8.4	5.4
PTEC1	34.6N	120.7W	1.9	7.0	8.6	52.5	30.5	1.4		85.5	0.8	0.1	0.6	4.7	0.5	0.5	7.2
ROAM4	47.9N	089.3W	3.5	10.8	31.8	44.9	12.4			11.6	14.5	5.2	11.2	11.0	16.7	17.1	12.6
SBIO1	41.7N	082.8W	0.7	6.6	45.0	44.1	4.2	0.1		7.8	11.5	11.8	4.6	12.4	15.3	21.8	14.7
SGNW3	43.8N	087.7W	5.1	13.9	46.8	34.0	3.3			17.3	6.0	4.3	9.8	25.4	8.0	20.7	8.5
SISW1	48.3N	122.9W	4.6	21.9	45.7	26.5	5.9			1.9	3.3	5.1	16.3	10.6	12.3	42.3	8.0
SJLF1	30.4N	081.4W	2.0	3.4	30.2	64.4				15.9	4.2	5.7	35.1	28.2	5.7	0.7	4.5
SRST2	29.7N	094.1W	0.4	4.3	31.8	60.4	3.3	0.1		11.4	10.7	4.9	25.0	39.8	4.3	0.4	1.4
WPOW1	47.7N	122.4W	6.8	23.4	47.8	27.9	0.9			11.5	10.1	1.0	4.6	50.3	10.6	1.9	0.5

MAY 1984			% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.8		0.1	0.3	1.1	0.5	0.7	0.9	2.1	0.4	0.5	1.7	3.4	3.2	3.2	3.6	3.4	1.7	0.5	2.6	14.3	23.0	3.3	5.6
41002	32.3N	075.3W	0.5	0.1	0.4									4.2	3.0	1.2	2.5	0.6	1.9			27.8	44.1	5.0	0.4	1.9
41006	29.3N	077.3W	0.1	0.6	0.5	0.4	2.2	0.5	0.6		1.9	9.3	1.3	4.3	14.7	7.5	1.9	0.5	6.6	4.1	2.2	19.2	11.8	6.6	1.1	1.4
42001	25.9N	089.7W									0.5	1.9	6.9	2.3	1.6			0.3	1.6	10.3	18.4	31.8	3.2			
42002	26.0N	093.5W	0.4	0.4	0.3	0.3		0.3		0.4		1.4	8.8	7.6	5.5	0.3			1.1	11.8	11.1	36.8	9.2			0.1
42003	26.0N	085.9W		0.3			0.1	0.1	0.1		1.7	6.8	8.8	3.1	1.3	0.7	0.3	0.5	3.1	12.7	17.3	30.0	3.8	0.6	0.1	<.05
42007	30.1N	088.9W	0.9	0.8	0.5	0.9	1.2	0.9	1.0	1.0	2.9	3.0	3.5	11.0	13.7	3.5	1.9	1.6	5.1	6.5	4.9	16.1	12.5	1.9	0.3	0.4
42008	28.7N	095.3W	0.3	0.2	0.2	0.6	0.3	<.05	0.1		0.7	2.2	6.6	7.7	2.3	1.2	0.2	0.1	3.2	6.6	13.7	33.3	12.4	2.4	0.2	0.4
42009	29.3N	087.5W	0.2	1.2	2.6	2.3	1.0	0.9	1.0	0.8	2.6	6.0	9.8	15.9	5.7	2.4	2.6	2.7	4.8	5.0	4.2	16.1	6.7	1.4	0.1	0.5
42011	29.6N	093.5W	0.3	0.1		0.2	0.6	1.0	0.1	0.3	1.2	1.7	2.0	3.7	7.8	4.0	0.4	0.2	3.5	6.6	6.1	14.1	27.2	6.3	0.5	0.3
44004	38.5N	070.7W															3.7	3.7					19.4	13.9	39.8	15.7
44005	42.7N	068.3W	1.5	0.2	0.8	0.5	2.3	1.6	1.8	1.6	2.4	0.7	0.7	2.6	7.6	10.3	7.8	3.8	2.2	0.2	2.8	4.4	19.3	13.6	9.6	0.9
44007	43.5N	070.1W	1.1	0.5	0.9	1.3	0.6	1.2	1.4	0.8	5.2	4.3	1.8	3.3	6.2	8.5	9.5	5.8	3.4	1.9	3.4	2.3	17.9	7.0	7.0	3.9
44008	40.5N	069.4W	0.2	0.2	0.3	0.9	0.5	0.7	1.8	2.5	1.3	0.7	1.9	4.2	4.1	10.8	14.2	4.5	3.4	0.4	1.4	6.5	20.7	12.0	5.7	0.8
44009	38.5N	074.6W	1.0	0.1	0.7	0.2	0.2	0.9	0.9	1.7	2.6	4.0	4.4	5.4	8.2	5.6	3.7	4.0	3.8	1.5	2.0	1.0	22.4	6.6	4.4	11.5
44011	41.1N	066.6W	0.4	1.7	0.9	0.5		0.8	2.3	2.2	2.2	4.2	3.4	17.1	7.0	11.7	10.2	1.8				7.4	12.2	9.4	4.6	
45001	48.0N	087.6W	0.8	1.1	0.7	1.1	1.4	1.9	1.3	0.3	6.4	5.6	2.5	7.6	6.2	13.5	18.5	16.1	0.3	0.1		2.8	2.8	5.7	1.4	2.1
45002	45.3N	086.3W	0.9	0.5	0.2	1.3	1.6	0.6	1.2	0.8	8.9	5.1	4.0	4.3	15.0	14.0	10.0	7.5	2.6	1.3	1.1	0.2	8.4	5.8	2.6	1.4
45003	45.3N	082.8W	0.4	0.1	0.9	0.5	0.8	2.2	1.2	0.5	3.6	3.6	8.4	5.3	10.1	8.1	15.4	11.4	0.9	1.4	1.0	2.9	5.2	0.2	10.4	5.3
45005	0.0N	000.0W	0.3	0.4	1.3	0.9	0.9	4.3	4.0	2.0	4.0	4.3	7.0	3.2	9.6	13.8	18.1	12.0		6.8	3.4	0.1		2.1	0.8	0.8
45006	47.3N	090.0W	0.4	0.9	3.2	1.8	1.6	1.4	1.3	1.5	4.2	10.9	5.0	5.0	5.5	18.3	17.6	7.9		1.1	1.1	0.5	0.6	6.9	2.7	0.9
45007	42.7N	087.1W	0.8	1.0	1.0	1.9	1.7	1.5	0.9	1.4	6.6	3.3	2.9	8.1	17.1	11.1	9.4	9.1	5.3	2.9	0.2	2.1	4.6	1.8	3.4	2.0
45008	44.3N	082.4W	1.0	0.7	0.3	0.7	1.2	0.9	1.5	1.2	5.0	2.6	4.9	7.7	10.7	13.5	14.0	10.3	3.3	3.8		1.8	6.3	2.2	2.5	3.0
46001	56.3N	148.3W	1.6	0.8	0.9	0.5	0.5	1.4	1.7	1.6	5.0	4.8	5.2	2.5	7.1	18.1	12.4	7.1		5.5	12.2	3.0	0.8	3.2	3.1	0.8
46002	42.5N	130.3W	0.9	0.4	0.1	0.2	0.4	1.1	2.2	1.4	4.3	3.1	1.5	1.0	5.6	6.1	8.1	7.1	4.7		1.1	2.4	10.0	10.6	12.3	13.0
46003	51.9N	155.7W	0.4	0.4		0.4				0.4	6.8	2.3	1.9	1.7	2.9	11.8	12.5	4.8	3.7	3.0	2.6	3.6	5.4	7.1	19.1	6.3
46004	51.0N	136.0W	0.4	0.1	0.1	0.9	0.8	0.8	1.0	0.3	0.9	0.4	1.8	2.9	7.0	7.8	5.8	4.5	0.9	1.1	2.9	11.0	12.7	13.6	9.2	4.1
46006	40.7N	137.7W	0.1	0.1	0.1	0.1	0.1	0.4	0.1	0.4	2.6	3.1	0.8	0.2	1.0	3.7	3.9	4.0	5.8	1.3	0.6	0.6	11.3	10.3	10.0	15.6
46011	34.9N	120.9W	0.7	<.05	0.2	0.2	0.1	0.7	0.9	1.2	2.8	<.05	0.4	0.2	0.7	1.3	1.1	9.5	0.2							62.1
46012	37.4N	122.7W	0.3	0.6	0.3	0.7	0.2	1.1	0.8	0.8	4.8	0.1	0.1	0.6	4.5	1.4	2.0	14.4	14.5			0.1	2.2			33.4
46013	38.2N	123.3W			0.7	1.0	1.4	0.2	1.5	0.4	0.1			2.4	2.2	0.9	7.1	5.1				0.6	0.3	0.3	11.2	36.3
46016	63.3N	170.3W	1.4	0.6	4.1	0.3	0.7	0.2	0.7	0.9	2.5	4.3	17.6	5.6	2.6	1.7	4.7	2.4	5.8	6.7	13.5		4.0	2.0	11.6	4.0
46017	60.3N	172.3W	0.4	0.4	0.8	0.5		3.1	1.6	2.3	12.2	12.0	6.3	4.2	3.0	6.1	2.9	2.2	7.3	8.2	12.8	3.4	3.1	4.9	0.9	0.5
46022	40.8N	124.5W	1.8	0.6	1.3	1.4	1.7	0.9	0.6	1.3	22.2	2.4	0.3	1.9	1.7	3.8	0.9	4.5	32.2	0.2			4.9	2.3	0.1	5.2
46023	34.3N	120.7W	0.4	0.2		0.5	0.3	<.05	0.5	0.5	1.6	0.2	0.8	0.5	1.5	0.9	1.3	3.2	3.0	<.05					0.2	24.5
46024	32.8N	119.5W	0.8	1.5	1.8	0.6	1.0	1.1	2.0	1.3	1.2	0.7	1.9	1.4	1.5	1.5	7.9	6.6							5.9	42.7
46025	33.6N	119.0W	1.3	1.2	3.4	3.3	5.9	5.0	3.6	2.7	1.5	1.2	3.4	8.3	5.5	8.0	19.9	5.8				0.1	0.1		10.5	6.7
46026	37.8N	122.7W	0.5	0.1	0.1	0.4	1.6	1.7	0.9	0.9				0.2	3.6	2.6	9.8	9.6					1.7	0.2	11.2	43.8
46028	35.8N	121.7W	0.1		0.4	0.5	0.9	0.4	0.7	0.4	0.3		0.1	1.2	0.9		3.2	3.8	0.8						1.9	36.3
46029	46.2N	124.2W	0.8	0.4	1.1	0.8	1.9	1.3	2.4	1.0	4.8	1.1	1.8	2.5	4.1	8.8	9.1	7.9	5.0	0.3	1.8	1.6	11.1	12.3	7.3	8.5
51001	23.4N	162.3W	0.5	0.4	0.9	0.4				0.3	0.3	7.9	34.0	6.0						4.3	44.3	0.7				
BURL1	28.9N	089.4W	0.2	1.9	0.7	0.6	1.3	1.0	0.7	1.3	4.1	9.4	15.0	7.4	1.4	2.7	1.0	1.2	7.4	3.3	13.9	15.4	1.2	0.4		0.8
CSBF1	29.7N	085.4W	3.0	5.1	1.8	7.3	4.0	1.9	2.1	2.9	8.3	3.9	3.2	17.9	17.4	6.1	4.9	1.2	0.3			0.5	5.6	1.3	1.4	<.05
DBLN6	42.6N	079.5W	0.4	0.3	0.9	0.6	2.1	1.9	1.9	0.5	1.9	3.8	2.0	3.2	11.2	15.0	4.5	2.3	1.7	5.4	1.3	1.1	1.1	23.4	2.8	2.0
DISW3	47.1N	090.7W	0.4	3.0	2.2	1.2	0.7	2.7	1.0	1.0	4.0	10.6	11.1	4.5	5.8	8.0	2.0	2.1	1.1	2.9	1.5	0.6	2.4	18.2	7.7	2.6
FBIS1	32.7N	079.9W	0.8			0.2	1.6	1.6	0.6		6.3	2.2	1.0	3.6	29.1	6.8	1.5	1.2	10.7	2.6	3.2		18.1	8.3	0.3	
GLLN6	43.5N	076.3W	1.0	0.2	0.6	1.3	1.2	1.5	2.1	0.9	2.8	2.1	1.5	3.1	8.2	12.8	7.0	3.7	1.4	4.2	0.2	3.3	12.2	8.0	15.1	1.9
NWP03	44.6N	124.1W	1.5	2.5	7.1	2.0	0.6	1.4	0.7	2.6	4.8	1.2	7.4	2.0	3.1	5.4	6.6	11.6	9.4			<.05	2.2	11.9	4.6	4.2
PILM4	48.2N	088.4W	2.3	0.7	0.5	1.6	0.6	0.7	2.6	1.6	10.3	5.8	5.0	6.6	5.3	5.9	8.7	6.6	0.6	1.3	3.0	1.2	8.3	7.5	10.5	0.2
PTAT2	27.8N	097.1W	0.1		0.8	0.4		<.05	0.2		0.5	1.9	14.6	9.3	1.5	0.1	0.5	0.4	5.8	4.5	17.8	33.4	5.0	0.4		
PTGC1	34.6N	120.7W	1.8	0.7	0.1	0.6	1.5	0.4	0.4	1.5	5.3				1.8	0.1	0.1	1.2	49.3	0.1			1.2			1.7
ROAM4	47.9N	089.3W	0.7	0.5	1.4	1.2	1.9	0.9	1.9	2.3	3.3	4.7	2.5	4.6	5.6	4.5	3.7	2.8	4.3	7.8	1.3	4.2	2.8	8.7	9.8	6.1
SBIO1	41.7N	082.8W	0.7	1.2	1.7	0.7	0.7	0.4	0.6	0.7	5.2	6.9	8.5	3.4	5.2	4.8	7.2	3.9	2.0	3.3	1.6	0.6	6.3	9.4	11.2	9.8
SGNW3	43.8N	087.7W	2.3	1.1	0.8	3.1	1.8	1.9	1.8	1.0	6.8	3.6	2.9	5.3	13.7	4.4	7.5	2.7	6.6	1.1	0.6	1.1	9.5	1.3	11.0	4.8
SISW1	48.3N	122.9W	1.4	1.2	1.2	2.3	4.5	2.6	5.1	3.7	0.3	2.1	2.2	6.5	5.2	8.2	17.5	3.6	0.2		1.7	5.1	0.5	1.6	16.8	0.5
SJLF1	30.4N	081.4W	0.5			1.3	0.7	0.7		0.2	2.2	1.5	2.2	11.6	7.9	3.0	0.7	1.2	13.3	2.7	3.5	22.1	19.6			5.2
SRST2	29.7N	094.1W	1.4	0.6	0.3	0.5	0.7	<.05	0.2	0.5	5.0	8.4	1.3	6.3	8.5	1.4	0.1	0.8	4.9	1.7	3.0	16.7	30.1	3.8		<.05
WPOW1	47.7N	122.4W	4.7	6.4	0.2	2.6	5.2	2.7	1.1	0.5	5.7	10.7	0.8	3.3	22.8	4.2	0.3		1.1	1.1		0.7	21.8	3.2		

MAY 1984			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	5.0	0.1		3.8	7.6	4.0		2.4					0.1	0.1										
41002	32.3N	075.3W	0.8			1.1	4.2			0.1																
41006	29.3N	077.3W					0.8																			
42001	25.9N	089.7W	2.8	2.4	0.7	10.4	5.0																			
42002	26.0N	093.5W	1.1	1.5	0.2	1.1	0.6																			
42003	26.0N	085.9W	1.7	1.2	1.9	0.4	3.3	0.1																		
42007	30.1N	088.9W	0.2	2.1		0.1	1.2	<.05		0.1																
42008	28.7N	095.3W	2.5	0.8	0.9	0.5	0.1			<.05																
42009	29.3N	087.5W	2.8	0.4				0.1																		
42011	29.6N	093.5W	1.6	2.7		1.3	4.3	1.5	0.2				0.1	<.05												
44004	38.5N	070.7W						3.7																		
44005	42.7N	068.3W			0.4	0.1	0.1																			
44007	43.5N	070.1W			0.4		0.4																			
44008	40.5N	069.4W					0.1	0.1																		
44009	38.5N	074.6W	0.1				2.5			0.6																
44011	41.1N	066.6W																								
45001	48.0N	087.6W																								
45002	45.3N	086.3W							0.5																	
45003	45.3N	082.8W						0.1	0.3																	
45005	0.0N	000.0W																								
45006	47.3N	090.0W																								
45007	42.7N	087.1W																								
45008	44.3N	082.4W						0.4	0.4																	
46001	56.3N	148.3W																								
46002	42.5N	130.3W				0.4	0.1	0.2	1.5	<.05																
46003	51.9N	155.7W	2.4			0.4																				
46004	51.0N	136.0W		0.1	2.4	3.2	0.4	0.3	2.6																	
46006	40.7N	137.7W			1.0	0.9	3.1	9.3	9.4	0.1																
46011	34.9N	120.9W								17.8																
46012	37.4N	122.7W	2.5							14.2																
46013	38.2N	123.3W							3.2	25.2																
46016	63.3N	170.3W		2.4	2.2			0.4																		
46017	60.3N	172.3W										0.9														
46022	40.8N	124.5W	4.4				2.3	<.05		0.9																
46023	34.3N	120.7W	1.7							54.9								3.4								
46024	32.8N	119.5W							0.1	18.3								0.1								
46025	33.6N	119.0W							1.5	0.8																
46026	37.8N	122.7W							0.1	10.9																
46028	35.8N	121.7W							0.2	47.8																
46029	46.2N	124.2W				0.1	2.2	0.1																		
51001	23.4N	162.3W																								
BURL1	28.9N	089.4W	3.2	0.4		1.5	2.0			0.5																
CSBF1	29.7N	085.4W																								
DBLN6	42.6N	079.5W		1.2				7.2	0.2	<.05																
DISW3	47.1N	090.7W					0.1	1.3	0.7	0.5																
FBIS1	32.7N	079.9W																								
GLLN6	43.5N	076.3W				0.1	0.6	0.9	2.2	<.05																
NWP03	44.6N	124.1W	0.4				1.9	3.8							0.2	0.1										
PILM4	48.2N	088.4W				0.6	1.2	0.7	0.2																	
PTAT2	27.8N	097.1W	1.1	0.3		0.9	0.1			0.1	0.1															
PTGC1	34.6N	120.7W	28.2				0.1			2.2	0.8							0.5								
ROAM4	47.9N	089.3W	3.3	1.5		1.2	0.7	2.6	1.7	1.5																
SBIO1	41.7N	082.8W		0.1			0.2	0.8	2.8	0.2								0.1								
SGNW3	43.8N	087.7W	1.5	0.3		0.3	0.4	0.3	0.4																	
SISW1	48.3N	122.9W				2.4	0.4		2.9	0.1																
SJLF1	30.4N	081.4W																								
SRST2	29.7N	094.1W	0.1		0.1	1.5	0.4	1.1					0.1	<.05												
WPOW1	47.7N	122.4W					0.5	0.5																		

JUNE 1984			AIR TEMPERATURE (DEG C)								SEA TEMPERATURE (DEG C)								AIR-SEA TEMPERATURE DIFFERENCE (DEG C)							
BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.9W	717	30	26.4119	19		16.7101	05		23.71	717	30	26.0119	20		22.6101	06		24.41	717	30	01.1130	03	-06.1101	03	-00.71		
41002	32.3N	075.3W	716	30	27.3129	18		20.0101	01		24.71	716	30	27.6116	19		24.5103	01		26.01	716	30	00.8130	15	-06.9101	01	-01.31		
41006	29.3N	077.3W	719	30	27.4129	17		21.1101	07		25.31	719	30	28.8118	21		25.9102	04		26.21	719	30	00.6103	13	-03.2101	03	-00.91		
42001	25.9N	089.7W	239	30	29.1122	21		19.7101	00		25.41	240	30	30.3122	21		25.6101	12		27.31	240	30	-00.4112	15	-06.1101	00	-01.91		
42002	26.0N	093.5W	238	30	29.1124	00		22.5101	09		26.51	238	30	30.6129	21		25.2101	06		27.21	238	30	00.3106	15	-02.7101	09	-00.71		
42003	26.0N	085.9W	720	30	29.4109	05		23.5126	12		27.41	720	30	31.0127	21		25.9101	05		27.71	720	30	02.9112	12	-05.3129	23	-00.31		
42007	30.1N	088.9W	717	30	31.6121	18		20.5101	10		26.21	718	30	31.2121	19		22.1101	10		26.91	718	30	01.7115	00	-04.0127	17	-00.71		
42008	28.7N	095.3W	719	30	31.2126	16		21.6101	06		26.31																		
42009	29.3N	087.5W	714	30	28.4124	16		21.0101	01		25.61	716	30	29.1125	20		23.4101	10		26.41	716	30	01.0110	18	-05.7130	19	-00.91		
42011	29.6N	093.5W	718	30	30.4126	19		21.1101	01		26.41																		
44005	42.7N	068.3W	719	30	17.2110	22		07.7105	11		13.21	718	30	14.9130	21		08.7101	00		11.41	719	30	02.3112	01	-02.3105	11	01.81		
44007	43.5N	070.1W	705	30	16.8109	22		07.5104	23		14.61																		
44008	40.5N	069.4W	698	30	20.3129	20		09.0102	12		14.91	698	30	18.0130	19		07.9103	12		12.51	700	30	07.2110	05	-02.3102	11	02.41		
44009	38.5N	074.6W	710	30	24.5122	16		12.9101	10		19.91	709	30	23.7122	18		14.1101	13		18.71	719	30	04.8119	17	-03.8117	07	01.21		
44010	36.9N	075.7W	712	30	26.0119	18		14.9101	09		21.81	712	30	25.7125	20		14.4103	03		20.71	716	30	04.5102	23	-02.0126	09	01.11		
44011	41.1N	066.6W	719	30	18.7118	20		08.0105	04		13.71	719	30	18.3120	22		07.9103	14		11.21	719	30	04.6126	08	-04.3121	08	02.51		
44012	38.8N	074.6W	455	20	26.4113	15		16.0117	08		21.01	456	20	22.2125	18		14.4112	00		19.61	456	20	09.3113	14	-03.5117	08	01.41		
45001	48.0N	087.6W	718	30	10.0108	19		03.3113	04		05.51	719	30	03.5126	19		02.5101	00		02.91	719	30	07.2109	00	00.4113	04	02.61		
45002	45.3N	066.3W	715	30	17.4123	22		03.5103	05		08.61	715	30	11.0119	22		03.0101	03		05.01	716	30	10.3119	20	-00.1126	09	03.61		
45003	45.3N	082.8W	719	30	12.0104	21		07.8101	03		07.41	720	30	04.2130	23		02.2101	09		03.01	720	30	12.2107	02	01.2116	04	04.41		
45004	47.2N	086.5W	035	02	06.7129	23		04.7130	10		05.71	035	02	03.4130	19		03.0129	12		03.11	035	02	03.6129	23	01.6130	10	02.51		
45005	41.7N	082.5W	714	30	27.7113	20		13.3102	09		19.61	714	30	23.1126	22		11.3101	05		18.51	714	30	07.1109	22	-05.5115	06	01.11		
45006	47.3N	090.0W	719	30	12.3128	01		03.8101	10		08.61	719	30	03.8130	17		02.6101	02		03.21	719	30	08.8126	01	00.9114	10	03.51		
45007	42.7N	087.1W	719	30	19.2118	22		05.2103	07		10.01	720	30	13.4129	01		03.1101	04		05.31	720	30	14.6113	04	01.2129	16	04.71		
45008	44.3N	082.4W	719	30	14.0129	21		06.0101	04		09.21	720	30	12.2128	21		06.0101	11		07.71	720	30	09.4109	10	00.1129	02	03.31		
46001	56.3N	148.3W	719	30	13.5123	01		07.4103	15		09.51																		
46002	42.5N	130.3W	719	30	14.9126	06		10.2105	02		12.31	719	30	14.9124	03		12.3101	06		13.11	719	30	01.0126	06	-02.4105	02	-00.81		
46003	51.9N	155.7W	646	30	10.8127	13		05.8102	03		08.11	646	30	09.9128	03		04.4101	03		06.31	676	30	01.6127	13	-02.1112	20	-00.21		
46004	51.0N	136.0W	705	30	11.6124	04		08.1101	00		10.01	709	30	09.8128	22		04.2102	11		10.41	709	30	00.5122	04	-01.8126	17	-00.51		
46005	46.1N	131.0W										710	30	13.5124**	22		09.8104**	10		11.61									
46006	40.7N	137.7W	717	30	16.9122	09		09.4112	11		13.51	717	30	17.3121	02		13.4106	11		15.31	717	30	00.4105	14	-05.2112	11	-01.81		
46011	34.9N	120.9W	718	30	14.5130	01		11.0112	14		12.61	718	30	16.0101	06		11.6109	03		13.51	718	30	01.6110	01	-04.0101	13	-00.91		
46012	37.4N	122.7W	718	30	14.0129	11		10.7101	14		12.31	714	30	13.7129	01		10.5104	08		12.21	714	30	01.9111	02	-01.8124	02	00.11		
46013	38.2N	123.3W	715	30	13.1127	06		09.0114	15		10.81	715	30	10.6126	00		08.6113	07		09.21	715	30	03.9127	06	-00.5116	13	01.61		
46014	39.2N	124.0W	717	30	13.5127	21		09.2126	15		11.41	718	30	12.6106	00		08.9119	13		10.41	718	30	02.8121	20	-01.5126	15	01.01		
46016	63.3N	170.3W	233	30	15.7126	00		00.1101	12		05.71																		
46017	60.3N	172.3W	227	30	11.2127	21		00.1107	00		04.21																		
46022	40.8N	124.5W	716	30	17.2126	04		08.0101	21		11.41	716	30	15.4127	20		08.9103	14		10.41	716	30	03.0126	19	-02.4126	13	00.81		
46023	34.3N	120.7W	714	30	14.9106	21		11.8125	13		13.21	713	30	16.0116	21		12.9109	09		14.51	714	30	00.9110	02	-03.2126	14	-01.31		
46024	32.8N	119.5W	715	30	17.4111	21		13.1113	13		14.71	246	11	16.6129	21		15.5121	15		16.01	246	11	-00.1130	02	-02.6123	12	-01.21		
46025	33.6N	119.0W	719	30	19.5130	21		13.7123	13		16.41	718	30	20.7130	21		16.8101	16		18.51	719	30	00.9101	19	-04.9123	13	-02.01		
46026	37.8N	122.7W	718	30	13.6127	02		09.2113	15		11.01	713	30	13.4121	22		09.0110	09		11.01	714	30	02.3111	01	-01.2123	13	00.01		
46027	41.8N	124.4W	598	25	15.9127	00		07.8119	12		10.51	598	25	14.2128	23		08.7118	08		09.11	600	25	04.0127	00	-01.4128	16	01.31		
46028	35.8N	121.7W	719	30	17.8116	20		10.7116	11		12.21	719	30	14.1116	22		10.7112	13		12.21	719	30	01.6110	21	-02.1116	12	01.01		
46029	46.2N	124.2W	716	30	16.2126	01		09.7106	10		12.91	712	30	16.5130	23		09.9116	08		12.81	716	30	03.3125	23	-03.0110	22	-00.41		
51001	23.4N	162.3W	410	30	26.2130	04		22.7124	01		25.11	410	30	26.3130	01		25.2101	17		25.71	410	30	00.3102	04	-03.2124	01	-00.61		
BURL1	28.9N	089.4W	717	30	24.4126	17		19.5101	09		25.91																		
CSBF1	29.7N	085.4W	705	30	29.9126	10		19.6101	01		25.61																		
DRLN4	42.6N	079.5W	718	30	30.9108	20		09.3102	09		18.81																		
DISW3	47.1N	090.7W	719	30	23.0125	21		05.1110	00		10.51																		
FBIS1	32.7N	079.9W	719	30	31.0120	15		16.2101	12		25.51																		
GLLN4	43.5N	076.3W	720	30	25.8123	19		07.6101	01		15.11																		
NWP03	44.6N	124.1W	519	23	15.4130	00		07.6110	14		11.61																		
PILM4	48.2N	088.4W	710	30	16.2118	18		03.8103	03		07.31																		
PTAT2	27.8N	097.1W	717	30	28.4124	22		22.7101	00		26.61																		
PTGC1	34.6N	127.7W	712	30	17.1126	22		09.4122	15		12.21																		
ROAM4	47.9N	089.3W	708	30	14.4125	00		03.3101	02		07.11																		
SBI01	41.7N	082.8W	698	30	31.4113	20		12.2115	05		20.71																		
SGNW3	43.6N	087.7W	717	30	29.0112	23		07.8102	12		15.21																		
SISW1	48.3N	122.9W	717	30	17.1126	23		09.8106	09		11.41																		
SJLF1	30.4N	081.4W	700	30	34.3121	17		18.3102	12		25.61																		
SRST2	29.7N	094.1W	718	30	31.1124	17		20.7106	21		26.11																		
WPOW1	47.7N	122.4W	715	30	24.4124	00		08.7101	12		13.01																		

JUNE 1984			PRESSURE (MB)								WIND SPEEDS (KNOTS)					MEAN WIND SPEED (KNOTS)								
BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	MAX	DY	HR	DIR	N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	717	30	1026.4107	15		1008.7102	19		1018.21	708	32102	13	300		12.11	11.01	10.81	11.01	13.01	11.91	13.31	16.91	12.41
41002	32.3N	075.3W	716	30	1025.5107	15		1009.8125	22		1017.71	692	25101	11	330		7.91	6.31	9.81	7.91	9.61	9.21	11.81	12.51	09.81
41006	29.3N	077.3W	719	30	1024.1116	17		1010.4126	09		1017.91	700	22112	19	120		13.01	8.21	9.11	9.81	10.51	9.41	9.11	7.51	09.61
42001	25.9N	089.7W	240	30	1019.9102	15		1012.4127	09		1016.71	240	20101	001	040		6.01	12.21	11.41	11.91	9.21	9.71	9.91	6.91	11.11
42002	26.0N	093.5W	238	30	1020.0107	15		1012.6105	02		1016.41	237	19107	15	140		4.01	11.91	10.81	12.21	9.71	9.41	8.31	7.31	10.91
42003	26.0N	085.9W	720	30	1020.1107	15		1011.3127	09		1016.51	710	28110	19	010		7.31	11.21	12.41	13.11	7.31	6.91	9.41	9.41	11.31
42007	30.1N	088.9W	718	30	1021.8102	14		1010.4127	08		1016.81	700	27115	021	070		6.51	7.61	8.91	10.21	7.41	8.71	8.51	7.81	08.71
42003	28.7N	095.3W	719	30	1020.4113	17		1009.6130	23		1015.41	719	23108	05	130		2.01	4.51	10.91	13.61	11.11	10.11	9.81	6.81	12.31
42009	29.3N	087.5W	714	30	1021.4116	14		1009.7127	08		1015.51	681	25110	19	260		6.41	7.71	8.51	8.71	6.01	9.21	8.41	8.81	08.11
42011	29.6N	093.5W	718	30	1021.1101	14		1010.2127	07		1015.91	703	24106	21	180		8.31	4.11	7.41	13.51	11.51	9.71	9.71	9.21	11.01
44005	42.7N	068.3W	719	30	1027.1116	14		992.6102	07		1013.91	713	19102	03	020		10.11	9.11	7.51	10.91	9.91	9.31	6.61	9.11	09.41
44007	43.5N	070.1W	707	30	1027.8116	13		995.1102	08		1013.51	696	22104	17	060		10.11	9.21	6.51	10.21	11.71	10.61	7.11	9.51	10.01
44008	40.5N	069.4W	699	30	1028.0116	17		991.4102	11		1014.61	687	23101	09	160		8.71	7.01	8.71	10.01	10.01	10.21	8.41	6.31	09.31
44009	38.5N	074.6W	712	30	1028.2116	16		1010.4122	11		1016.41	713	23101	101	340		9.11	5.81	3.91	8.91	11.61	10.91	7.41	11.01	09.81
44010	36.9N	075.7W	712	30	1026.8116	17		1007.1102	21		1016.81														
44011	41.1N	066.6W	719	30	1027.4117	02		994.5102	11		1015.01	703	26126	101	320		8.11	6.71	7.71	9.01	6.51	7.71	7.31	8.81	07.91
44012	38.8N	074.6W	455	20	1027.0116	16		1008.3130	21		1015.61	455	25128	091	210		8.01	7.81	6.91	6.11	10.61	11.11	6.31	10.01	09.21
45001	48.0N	087.6W	719	30	1027.1115	02		991.5104	15		1012.31	707	28110	001	230		5.41	6.91	6.91	7.81	7.61	7.31	8.41	7.41	07.61
45002	45.3N	086.3W	715	30	1027.5115	15		998.1127	05		1013.01	703	24108	091	190		6.01	5.11	6.11	7.41	10.71	8.81	7.21	7.11	08.21
45003	45.3N	082.8W	720	30	1029.2115	18		995.8127	15		1013.81	701	21111	061	290		4.71	4.91	6.51	8.41	9.51	7.31	9.61	8.51	08.21
45004	47.2N	086.5W	035	02	1022.3130	15		1018.7129	12		1020.41	035	18129	13	330		4.51						4.61	6.11	7.31	06.31
45005	41.7N	082.5W	714	30	1026.5115	17		1002.4127	18		1014.81	701	12114	001	310		4.41	5.91	5.21	4.01	4.31	5.51	6.01	4.61	05.11
45006	47.3N	090.0W	719	30	1027.6119	01		990.0108	13		1012.41	706	20109	001	250		5.91	7.21	7.01	5.81	5.81	7.81	8.81	6.31	07.31
45007	42.7N	087.1W	720	30	1026.5115	15		999.9127	09		1014.31	716	24108	121	170		7.21	6.31	7.11	8.71	9.21	6.81	6.71	7.11	07.81
45008	44.3N	082.4W	720	30	1028.6115	16		997.3127	11		1014.21	714	18115	011	190		4.61	4.91	5.11	7.01	9.61	8.41	8.01	6.91	07.41
46001	56.3N	148.3W	714	30	1028.4119	23		981.1126	21		1010.61	702	22125	041	110		8.01	7.01	9.81	9.91	8.21	9.31	10.41	7.71	09.21
46002	42.5N	130.3W	719	30	1030.4116	20		987.2106	02		1021.31	715	25106	121	320		12.91	7.71	3.61	9.11	12.41	9.81	10.11	11.91	11.61
46003	51.9N	155.7W	666	30	1026.1111	23		993.8127	03		1011.11	664	25128	201	170		15.21	10.51	9.31	8.51	9.81	11.21	11.41	11.91	10.61
46004	51.0N	136.0W	709	30	1027.1109	14		984.6127	15		1015.01	707	32127	171	230		6.91	10.11	10.11	16.11	12.61	13.71	12.71	9.31	12.71
46005	46.1N	131.0W	719	30	1031.7101	01		1000.9104	03		1019.71														
46006	40.7N	137.7W	717	30	1034.0101	01		1004.2105	15		1024.01	717	31106	011	310		9.21	8.11	6.11	7.31	11.21	14.51	12.91	12.61	11.51
46011	34.9N	120.9W	718	30	1019.2107	17		1000.0101	14		1014.31	277	24129	231	310		9.41						2.81	14.01	13.51
46012	37.4N	122.7W	713	30	1020.9107	21		1010.2106	13		1015.11	714	37110	031	320		10.81	1.01		9.51	10.31	5.21	6.81	14.51	13.41
46013	38.2N	123.3W	715	30	1022.0107	19		1010.0106	13		1015.41	708	30119	011	300		5.11	3.01	2.11	7.01	6.31	7.51	17.51	10.91	17.71
46014	39.2N	124.0W	718	30	1022.3108	16		1006.8106	10		1015.21	151	27130	011	320		9.41	5.81						15.31	12.01
46016	63.3N	170.3W	239	30	1000.1129	06		993.8129	06		1013.21	707	27	01	29		5.41	9.21	10.41	8.61	8.21	10.41	12.71	4.81	09.81
46017	60.3N	172.3W	234	30	1021.5120	21		994.7122	21		1010.41	233	23122	061	140		10.71	8.21	8.51	13.01	10.61	9.01	4.31	4.41	09.21
46022	40.8N	124.5W	716	30	1025.4108	05		1003.7106	11		1018.11	711	27101	001	340		12.31	5.51	3.91	6.31	12.81	7.01	4.91	10.51	11.41
46023	34.3N	120.7W	714	30	1019.1129	21		1008.6110	13		1014.01	714	34110	131	320		17.81						9.01	21.61	21.11
46024	32.8N	119.5W	715	30	1018.0129	17		1006.5110	01		1013.21	702	23110	101	310		9.11						10.21	14.11	13.31
46025	33.6N	119.0W	719	30	1018.0124	18		1006.1110	03		1012.61	702	24110	101	320		7.41	3.01	4.51	4.01	3.31	6.31	11.21	6.31	06.41
46026	37.8N	122.7W	713	30	1021.3107	19		1010.2106	13		1015.01	707	26110	011	310		6.31		1.01	8.21	8.51	6.31	11.21	14.91	12.51
46027	41.8N	124.4W	598	25	1025.9108	16		1002.9106	11		1018.31	597	39115	221	290		2.61	1.11	2.61	10.61	9.11	3.41	15.61	19.41	15.31
46028	35.8N	121.7W	718	30	1021.3107	20		1011.5105	11		1015.51	707	30110	051	310		5.11	1.81	3.91	6.21	2.01		7.31	17.91	16.81
46029	46.2N	124.2W	716	30	1028.9111	23		997.2106	02		1018.61	708	32104	151	310		10.81	5.91	4.91	11.41	10.81	8.01	8.81	8.11	09.51
51001	23.4N	162.3W	410	30	1023.0103	20		1015.9115	04		1019.41	410	18109	181	120			11.11	12.01	11.01					11.91
BURL1	28.9N	089.4W										717	40130	161	230		5.61	7.41	10.21	6.21	7.41	10.01	8.81	7.01	08.81
CSBF1	29.7N	085.4W	717	30	1022.4106	19		1010.9127	07		1017.31	717	21129	141	250		2.51	2.31	4.91	4.31	4.31	3.31	7.41	3.71	09.51
DRLN4	42.6N	079.5W	719	30	1027.4115	17		1002.6127	21		1015.31	718	23103	151	230		7.51	6.61	2.71	5.61	5.61	11.01	7.41	7.31	08.01
DISW3	47.1N	090.7W	719	30	1026.2116	15		1002.6127	14		1015.61	698	28103	041	280		4.31	6.21	6.61	5.31	11.21	11.41	13.01	10.11	09.11
FBIS1	32.7N	079.9W	719	30	1024.3107	17		1009.6125	22		1017.01	719	24121	031	020		5.71	9.31	9.31	7.71	7.41	8.81	5.61	3.91	07.61
GLLN4	43.5N	076.3W	719	30	1028.5116	14		1002.6127	20		1014.21	720	27128	041	240		5.81	6.31	5.31	9.61	10.31	10.61	12.11	2.91	09.61
NWP03	44.6N	124.1W	519	23	1027.7116	19		1013.6129	01		1020.11	519	25117	031	360		11.91	2.51	3.21	8.01	7.81	6.11	9.21	6.61	08.51
PILM4	48.2N	088.4W	710	30	1021.2115	18		989.4108	21		1012.11	710	24102	231	230		7.51	9.81	9.21	8.11	12.31	12.51	11.71	9.61	10.51
PTAT2	27.8N	097.1W	717	30	1018.1101	03		1007.3105	08		1013.61	717	27105	071	130					13.51	14.61	11.01	8.31		13.81
PTGC1	34.6N	120.7W										717	31104	031	350		14.51	6.81						9.51	13.81	17.91
ROAM4	47.9N	089.3W	719	30	1026.5114	15		988.5108	17		1012.31	720	42108	221	240		12.11	13.11	9.61	9.71	8.71	10.61	15.41	11.21	12.41
SBI01	41.7N	082.8W	697	30	1027.5115	16		1002.6127	16		1015.61	698	28103	041	280		4.31	6.21	6.61	5.31	11.21	11.41	13.01	10.11	09.11
SGNW3	43.8N	087.7W	720	30	1027.0115	16		997.8127	09		1013.41	720	29108	131	220		8.21	7.21	4.41	6.41	11.61	13.21	11.81	11.01	10.01
SISW1	48.3N	122.9W	716	30	1027.2101	10		1000.1104	16		1017.31	717	25108	001	270		4.01	4.21	1.91	6.31	5.61	9.41	10.81	3.61	09.31
SJLF1	30.4N	081.4W	719	30	1023.4116	17		1009.9125	19		1016.81	719	25121	221	160		4.81	8.41	9.01	10.71	10.31	6.41	9.81	8.81	08.31
SRST2	29.7N	094.1W	718	30	1020.5101	14		1010.4127	08		1015.21	718	26124	231	050		3.51	6.31	8.01	12.91	10.81	9.41	9.81	3.21	10.31
WPOW1	47.7N	122.4W	715	30	1027.5101	09		999.5104	17		1017.01	715	18127	001	180		4.11	4.71	3.71	3.91	7.41	7.31	1.01	2.41	06.01

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			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)						
BUOY	LAT	LONG	OBS	MAX	DY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	716	4.5	01	00	1.2	8.2	79.1	5.1	6.1	1.2			
41004	29.3N	077.3W	718	3.5	01	13	1.2	1.9	88.9	6.5	2.5				
42001	25.9N	089.7W	209	2.0	01	00	0.7	52.1	46.8	0.9					
42002	26.0N	093.5W	235	1.5	01	00	0.9	38.2	61.7						
42003	26.0N	085.9W	699	2.0	01	00	0.7	59.9	37.6	2.4					
42007	30.1N	088.9W	090	1.0	24	22	0.5	90.0	10.0						
44005	42.7N	068.3W	719	4.0	02	06	1.3	22.6	52.5	15.8	8.2	0.6			
44008	40.5N	069.4W	682	4.5	01	09	1.2	31.5	48.6	13.3	5.4	1.0			
44010	36.4N	075.7W	709	1.5	01	00	0.6	65.1	34.8						
44011	41.1N	066.6W	718	6.0	02	10	1.5	10.1	68.1	9.7	5.1	6.6	0.1		
45001	48.0N	087.6W	550	3.0	09	01	0.7	68.5	29.4	1.0	0.9				
45002	45.3N	086.3W	468	3.0	08	14	0.7	61.5	33.3	4.7	0.4				
45004	47.2N	086.5W	022	0.5	29	16	0.5	0.0							
45005	41.7N	082.5W	386	1.5	23	03	0.6	71.5	28.4						
45006	47.3N	090.0W	452	3.0	09	00	0.6	76.9	20.7	1.9	0.2				
45007	42.7N	087.1W	454	2.0	08	12	0.5	83.2	15.8	0.8					
45008	44.3N	082.4W	461	1.5	08	14	0.6	70.7	29.2						
46001	56.3N	148.3W	712	3.5	25	05	1.5	8.8	57.5	26.6	6.8				
46003	51.9N	155.7W	665	6.0	29	18	1.7	2.1	61.8	23.3	8.1	4.5	0.1		
46004	51.0N	136.0W	707	6.5	27	17	2.1	0.9	38.8	38.1	17.1	4.1	0.7		
46005	46.1N	131.0W	716	3.5	27	21	1.6	1.5	59.0	33.1	6.2				
46006	40.7N	137.7W	716	5.0	06	00	1.5	7.2	65.3	18.4	5.8	3.0			
46011	34.9N	120.9W	213	3.0	21	05	1.7		53.0	44.6	2.3				
46012	37.4N	122.7W	713	4.0	10	04	1.9		46.5	43.0	10.0	0.2			
46013	38.2N	123.3W	714	4.5	03	02	2.5		23.2	33.7	35.7	7.2			
46014	39.2N	124.0W	715	5.0	01	01	2.2	1.3	30.7	39.4	24.6	3.7			
46022	40.8N	124.5W	716	5.5	01	01	1.9	6.1	44.6	23.4	21.6	4.0			
46023	34.3N	120.7W	710	4.0	03	16	2.3		21.8	48.8	27.4	1.8			
46024	32.8N	119.5W	204	3.5	30	14	1.9		42.6	50.9	6.5				
46025	33.6N	119.0W	717	2.5	08	23	1.2	1.9	88.1	9.9					
46026	37.8N	122.7W	707	3.0	08	01	1.6	0.8	56.4	40.8	1.8				
46028	35.8N	121.7W	387	3.5	21	00	2.3		15.7	61.2	22.9				
46029	46.2N	124.2W	715	3.5	07	16	1.4	8.2	62.2	26.7	2.7				
51001	23.4N	162.3W	410	2.5	02	14	1.7		45.3	54.6					

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			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		4.8	32.6	54.2	8.3			9.6	7.7	10.1	7.3	13.8	35.3	6.7	9.5
41002	32.3N	075.3W		9.7	50.9	36.3	3.2			2.2	3.1	24.7	21.1	14.1	7.9	20.5	6.3
41006	29.3N	077.3W		5.4	58.6	35.9	0.1			4.0	5.2	19.3	21.9	7.1	18.9	18.5	5.2
42001	25.9N	089.7W		2.9	40.4	56.7				0.4	11.0	35.2	28.3	10.8	5.9	4.7	3.5
42002	26.0N	093.5W		3.4	44.3	52.3				0.8	0.2	13.2	45.6	13.1	4.5	1.3	1.3
42003	26.0N	085.9W		6.1	37.9	54.4	1.7			2.0	15.0	40.4	15.2	3.1	8.5	10.6	5.3
42007	30.1N	088.9W		8.0	62.3	29.4	0.3			6.6	5.1	10.5	26.6	10.1	18.5	12.6	10.0
42008	28.7N	095.3W		1.5	30.7	66.3	1.4			0.1	0.1	8.0	55.1	26.1	8.4	1.6	0.6
42009	29.3N	087.5W		9.1	62.7	28.0	0.1			4.4	6.2	22.1	17.8	5.5	19.5	18.7	5.8
42011	29.6N	093.5W	0.7	5.7	46.7	47.1	2.6			1.5	1.4	2.5	20.3	38.6	25.2	8.1	2.5
44005	42.7N	068.3W		5.5	60.0	34.5				6.8	3.5	6.2	14.0	22.1	26.8	9.3	11.2
44007	43.5N	070.1W		8.2	44.4	47.3	0.1			11.9	8.8	7.3	10.6	22.4	22.8	7.5	8.8
44008	40.5N	069.4W		7.3	51.8	40.5	0.4			10.7	4.5	4.3	14.5	17.7	30.5	9.6	8.2
44009	38.5N	074.6W	4.5	8.7	49.6	41.1	0.6			6.2	4.5	6.3	10.7	22.1	30.2	7.0	13.1
44011	41.1N	066.6W		13.4	63.9	22.5	0.3			8.0	3.0	4.8	15.0	16.8	25.4	10.5	16.6
44012	38.4N	074.6W	5.9	9.5	57.1	33.0	0.4			4.2	6.0	11.4	10.6	28.2	23.7	8.6	7.3
45001	48.0N	087.6W		10.6	74.3	15.1				4.1	5.4	11.4	21.5	14.7	13.1	15.1	14.7
45002	45.3N	086.3W		10.4	64.2	24.8	0.7			10.1	8.7	7.0	7.8	31.4	15.1	10.2	9.7
45003	45.3N	082.8W		7.1	68.9	24.0				3.2	2.8	11.4	15.0	22.7	8.4	23.0	13.5
45004	47.2N	086.5W		2.9	97.1					13.6					9.3	33.6	43.6
45005	41.7N	082.5W		22.1	76.9	1.0				4.6	9.3	19.9	11.2	11.2	26.3	11.8	5.7
45006	47.3N	090.0W		11.6	75.5	12.9				5.0	20.9	15.5	6.9	8.0	13.6	21.8	8.3
45007	42.7N	087.1W		5.3	76.5	17.9	0.3			15.3	6.8	8.9	11.6	29.2	12.6	7.5	8.1
45008	44.3N	082.4W		13.3	66.9	19.7				11.6	9.4	10.7	8.2	28.1	13.3	10.7	7.9
46001	56.3N	148.3W		9.7	59.4	30.2	0.7			6.2	9.0	17.1	25.6	13.7	10.6	12.5	5.2
46002	42.5N	130.3W		2.9	40.3	55.1	1.7			20.2	0.1	0.4	1.5	6.7	16.5	18.8	35.9
46003	51.9N	155.7W		6.8	47.7	42.9	2.6			3.9	1.8	8.1	11.9	21.0	23.1	24.8	5.5
46004	51.0N	136.0W		2.0	30.3	63.2	4.5			4.1	3.2	2.2	9.9	15.9	32.1	22.2	10.4
46006	40.7N	137.7W		6.6	43.2	44.4	5.9			13.8	8.4	4.4	4.3	12.9	18.5	15.8	21.9
46011	34.9N	120.9W		5.1	34.3	52.3	8.3			9.6						1.0	89.4
46012	37.4N	122.7W		2.9	28.3	59.9	8.3	0.6		14.3	<.05		2.3	5.7	2.7	6.5	68.4
46013	38.2N	123.3W		3.2	12.7	49.2	34.9			1.0	0.6	0.8	0.9	1.3	1.8	24.4	69.2
46014	39.2N	124.0W		2.0	14.4	41.7	41.9			53.8	1.3						44.9
46016	63.3N	170.3W		11.8	47.3	40.5	0.4			7.1	9.4	37.4	6.3	5.3	8.8	19.4	6.3
46017	60.3N	172.3W		5.2	59.2	34.3	1.3			13.9	28.6	15.3	11.9	4.5	19.8	4.4	1.4
46022	40.8N	124.5W		4.6	39.4	53.0	3.0			69.5	2.7	1.6	1.5	5.7	2.5	1.6	14.9
46023	34.3N	120.7W		0.3	6.3	44.5	48.7	0.1		6.9						1.9	91.2
46024	32.8N	119.5W		0.7	29.4	66.6	1.3			0.6						18.0	81.3
46025	33.6N	119.0W		23.9	62.3	13.8				1.0	1.8	4.7	10.0	7.8	12.0	52.8	9.9
46026	37.8N	122.7W		4.1	35.4	56.6	4.0			0.2		0.1	1.1	7.0	8.0	32.4	51.1
46027	41.8N	124.4W	8.5	13.2	27.8	27.6	25.1	6.2		6.0	3.4	2.1	7.3	1.8	2.1	23.2	53.9
46028	35.8N	121.7W		4.0	17.7	46.7	31.7			1.9	0.2	0.6	1.1	0.1		5.7	90.4
46029	46.2N	124.2W		7.6	50.1	42.1	0.1			38.4	1.4	2.3	1.6	10.3	10.5	10.0	27.5
51001	23.4N	162.3W			22.9	77.1					3.7	93.5	2.8				
BURL1	28.9N	089.4W	2.6	14.8	47.8	36.5	0.7	0.1		4.6	7.6	38.2	8.8	9.8	16.1	9.8	5.1
CSBF1	29.7N	085.4W	7.7	32.4	57.9	9.8				5.7	9.9	9.1	17.5	10.5	21.4	21.7	4.1
DBLN6	42.6N	079.5W	2.6	15.3	52.2	31.9	0.6			9.1	9.3	4.1	12.6	15.7	42.4	4.6	2.1
DISW3	47.1N	090.7W	5.4	14.6	53.1	28.4	3.5	0.4		8.5	24.9	14.3	4.6	5.6	28.4	8.5	5.1
FRIS1	32.7N	079.9W	1.9	12.1	67.6	20.2	0.1			3.4	2.9	12.0	15.2	31.4	19.5	9.8	5.7
GLLN6	43.5N	076.3W	3.9	11.1	47.4	40.1	1.4			9.2	4.8	2.0	7.4	26.0	24.2	21.1	5.2
NWP03	44.6N	124.1W	7.1	22.5	41.0	35.3	1.2			46.6	3.8	5.4	1.6	11.0	13.9	8.1	9.6
PILM4	48.2N	088.4W	2.2	7.6	48.7	40.2	3.1	0.4		8.4	20.4	13.6	7.6	12.4	13.9	12.3	11.4
PTAT2	27.8N	097.1W		0.4	17.7	80.5	1.4					19.6	67.9	10.1	2.4		
PTGC1	34.6N	120.7W	0.1	1.5	15.3	48.9	34.2			88.5	0.1					8.3	11.1
ROAM4	47.9N	089.3W	2.8	11.1	33.9	41.3	12.5	1.3		9.9	26.4	6.7	9.6	9.5	13.1	18.6	8.3
SBIO1	41.7N	082.8W	3.2	12.8	49.9	33.4	2.0			6.6	10.9	21.5	5.0	15.1	21.7	10.6	8.6
SGNW3	43.8N	087.7W	3.6	7.9	50.6	38.2	3.3			21.1	7.1	2.7	8.8	31.6	8.4	10.9	9.4
STSW1	48.3N	122.9W	3.1	15.2	45.5	37.5	1.8			1.1	0.5	1.4	6.4	7.0	18.8	60.0	4.8
SALF1	30.4N	081.4W	1.5	10.3	61.5	28.0	0.3			2.1	7.3	11.9	7.4	9.8	14.0	17.4	6.1
SMSF2	29.7N	094.1W	1.3	7.4	47.4	44.3	1.0			1.8	1.1	0.7	25.3	47.5	14.7	4.3	4.6
WPOW1	47.7N	122.4W	7.3	29.0	55.8	15.2				21.3	29.0	2.4	6.9	36.1	3.6	0.2	0.5

JUNE 1984			% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.21	0.61	1.11	0.51	0.31	2.01	0.11		3.01	2.01	3.01	2.31	5.01	11.11	3.71	2.51	6.21	5.01	4.01	4.61	6.91	20.91	1.51	3.21
41002	32.3N	075.7W	0.41	0.81	1.61	1.71	1.81	0.31	1.61	1.11	0.81	2.11	3.01	4.21	7.01	5.21	6.71	1.91	0.51	0.31	10.11	5.21	4.81	2.51	10.81	2.01
41006	29.3N	077.3W	0.41	0.51	0.21	0.61	0.71	1.01	1.41	0.71	0.61	3.11	13.61	12.51	2.31	11.71	10.61	4.21	3.01	1.71	5.41	8.61	4.11	6.21	6.91	0.31
42001	25.9N	089.7W		0.41	0.41	0.81	0.41	0.41		0.41	0.41	3.21	12.61	10.31	4.61	2.71	2.91	1.71		7.41	22.21	17.21	3.91	2.81	1.81	1.51
42002	26.0N	093.5W				0.81	1.21	0.91	0.41		0.81	0.11	33.91	17.01	7.21	3.61	0.81	0.81		0.11	19.31	27.71	4.71				0.41
42003	26.0N	085.9W	0.71	1.01	0.71	0.61	0.81	0.71	1.21	0.51	0.91	5.81	13.11	4.21	1.71	5.11	4.51	2.61	0.21	8.01	26.01	9.81	0.71	2.71	4.91	2.01
42007	30.1N	088.4W	0.91	0.91	0.91	0.91	0.71	1.41	1.21	1.11	5.11	2.81	5.71	3.21	0.51	2.51	3.11	6.61	0.71	1.41	3.71	2.51	0.91	4.81	3.21	2.11
42008	28.7N	095.3W	0.11	<.05	0.21	0.61	0.11	0.21	0.11	0.11		<.05	3.21	2.31	0.21	4.01	0.81	0.31			4.61	40.91	5.81	4.21	0.71	0.21
42009	29.3N	087.5W	0.61	0.71	1.21	1.21	1.11	1.21	1.81	1.11	2.91	5.21	14.91	10.81	4.01	11.11	10.21	3.61	0.91	0.31	6.01	5.81	0.31	7.01	6.61	1.11
42011	29.6N	093.5W	0.11	0.71	0.41	0.41	1.51	1.51	0.61	0.51	0.91	0.61	1.51	6.01	17.81	12.91	4.11	0.91	0.41		0.61	12.91	17.91	10.71	3.41	1.21
44005	42.7N	068.3W	0.71	0.51	0.41	0.31	0.91	1.11	0.91	0.71	3.81	1.51	4.71	6.51	12.31	17.11	7.41	4.81	2.31	1.51	1.11	7.31	8.91	8.71	1.01	3.71
44007	43.5N	070.1W	1.41	1.11	1.31	1.11	0.71	0.41	1.21	0.91	4.21	5.01	4.91	6.31	10.21	5.21	3.61	2.31	3.01	1.01	4.61	5.41	12.21	1.11	3.71	
44008	40.5N	069.4W	1.31	0.51	0.31	0.81	1.31	0.81	0.81	1.61	6.01	3.31	2.21	6.31	8.11	14.01	6.31	5.61	3.11	0.71	1.91	7.41	8.31	15.71	2.51	0.91
44009	38.5N	074.6W	0.71	0.91	2.61	0.81	0.41	1.51	0.81	0.91	3.31	3.41	3.01	7.21	10.31	12.11	4.71	5.71	2.21	0.11	0.61	2.61	11.41	16.71	1.41	6.01
44011	41.1N	066.6W	1.61	0.81	0.91	1.81	3.91	1.81	1.21	1.31	5.21	1.81	2.01	6.81	10.71	19.11	7.11	11.11	1.21	0.41	1.81	6.31	2.11	4.41	2.21	4.11
44012	38.8N	074.6W	0.91	0.71	1.91	2.51	1.11	1.21	1.01	0.21	2.01	5.01	7.41	6.51	14.41	12.41	4.91	4.61	1.41	2.41	2.01	1.61	12.71	9.61	0.71	2.51
45001	48.0N	087.6W	0.81	1.41	1.91	1.71	1.21	1.21	1.41	0.91	3.01	2.91	8.81	16.31	11.41	8.11	11.21	12.51	0.41	1.11	0.61	3.51	2.11	3.81	2.41	1.31
45002	45.3N	083.4W	2.51	1.81	1.61	1.11	1.41	1.01	0.81	0.21	4.21	6.81	5.41	5.71	14.31	5.91	8.01	7.51	0.41		0.61	14.81	8.21	5.41	1.41	1.21
45003	45.3N	082.8W	0.91	0.61	1.01	0.41	0.71	0.51	1.61	1.41	2.41	2.21	10.41	11.21	12.61	6.81	15.21	8.31			0.11	3.41	9.41	1.01	6.21	3.81
45004	47.2N	086.5W	2.91								10.71						9.31	33.61	43.61							
45005	41.7N	082.5W	2.11	1.91	3.11	4.51	3.51	3.71	1.41	1.91	2.51	7.41	16.71	6.71	7.71	22.21	10.01	3.61					0.11	0.41	0.41	0.11
45006	47.3N	090.0W	1.31	1.81	1.81	1.21	1.91	1.61	0.91	1.11	3.31	16.91	12.41	5.61	5.71	10.01	14.81	6.91	0.51	2.21	1.31	<.05	0.41	2.11	6.11	0.31
45007	42.7N	087.1W	0.81	0.41	0.51	0.51	0.61	0.71	0.91	0.81	2.81	6.41	8.41	9.41	17.81	11.01	5.61	5.91	1.61	<.05		2.71	10.51	5.81	0.81	1.41
45008	44.3N	082.4W	2.81	2.01	2.61	0.91	1.51	1.21	0.71	1.61	8.81	7.51	8.11	5.91	15.41	8.81	7.51	4.91				1.41	11.21	3.31	2.51	1.41
46011	56.3N	148.3W	0.11	1.61	2.51	2.41	1.41	0.81	0.61	0.41	6.01	6.61	8.11	14.51	8.71	5.61	5.81	4.21	0.11	0.91	6.41	8.01	3.71	4.21	6.21	0.61
46021	42.5N	130.3W		<.05	0.21		0.11	1.41	0.81	0.31	4.71	<.05	0.11	1.51	2.81	8.21	10.11	12.81	15.51	<.05			3.61	6.41	7.81	21.71
46031	51.9N	155.7W	0.11	0.21	1.41	0.71	1.31	1.21	1.51	0.31	0.11	0.61	3.11	7.71	11.71	11.71	10.61	2.41	3.71	0.91	5.61	3.51	7.21	9.91	11.81	2.41
46041	51.0N	136.0W	0.11	0.11		0.11	0.61	0.41	0.21	0.31	4.01	1.11	1.01	1.01	3.11	6.51	6.91	6.61		1.91	1.21	7.91	11.91	23.61	13.91	3.41
46066	40.7N	137.7W	0.81	1.21	1.01	0.71	0.91	0.41	0.41	0.51	8.51	3.61	2.61	2.31	5.11	5.51	6.21	9.31	4.61	2.91	0.81	1.21	6.61	10.21	7.61	10.51
46011	34.9N	120.9W	1.41						0.71	2.91	4.31						0.31	29.71	3.81							48.61
46012	37.4N	122.7W	0.21	<.05		0.31	0.21	0.81	0.71	0.71	1.91			1.11	2.81	1.91	5.21	15.71	10.91				0.81	2.31	<.05	0.61	45.41
46013	38.2N	123.3W	0.31	0.31	0.71	0.41	0.21	0.21	0.71	0.51	0.71	0.31	0.11	0.11	1.11	1.61	2.91	6.71					0.41		0.11	13.41	35.21
46014	39.2N	124.0W	1.21							0.81	32.91	1.31						10.11	18.71							23.01
46016	45.3N	170.7W	2.01	1.31	1.61	1.41	0.61	1.41	1.11	2.31	2.61	4.41	17.41	3.01	3.51	3.91	6.91	3.61	0.41	3.71	18.51	2.01	1.21	2.81	11.51	0.41
46017	40.3N	172.3W	0.31	0.61	0.81				0.51	2.61	0.51	5.31	21.11	11.11	4.21	2.01	12.71	2.01	0.91	0.41	6.91	3.21	6.81	2.51	6.71	
46022	40.8N	124.5W	1.31	0.41	0.81	0.21	0.41	0.51	0.31	0.71	23.21	2.31	0.81	1.21	1.21	1.61	1.21	7.91	42.31	<.05			0.11	4.01	0.41	0.11	6.01
46023	34.3N	120.7W							0.11	0.11	0.71						1.01	4.61	4.31							0.71	39.51
46024	32.8N	119.5W	0.31						0.21	0.21	0.41						10.21	18.91								7.61	61.01
46025	33.6N	119.0W	0.91	1.21	1.61	4.31	4.31	4.31	5.21	2.21	0.11	0.61	3.11	5.71	3.51	7.71	34.01	6.61						<.05	12.91	0.91
46026	37.8N	122.7W				0.11	0.81	1.01	0.81	0.81	0.21			0.81	0.81	5.41	15.21	10.31				0.11	1.41	0.91	7.41	36.71
46027	41.8N	124.4W	3.91	2.31	1.71	0.51	0.51	1.41	1.81	1.21	1.81	1.11	0.31	3.91	0.61	0.51	7.61	12.11	0.41		0.11	1.91	0.81	0.21	7.81	16.41
46028	35.8N	121.7W	0.71	0.21	0.41	0.31	0.11		1.31	1.01	1.01		0.21	0.81			3.11	12.61	0.21							1.31	65.21
46029	46.2N	124.2W	1.61	0.41	0.61		0.21	1.61	0.71	2.51	13.61	1.01	0.41	0.21	6.11	6.21	5.71	17.11	21.31	0.11	1.31	1.31	4.01	2.71	3.51	8.01
51001	23.4N	162.3W								1.31	20.51	1.21							2.41	73.01	1.61					
BURL1	28.9N	089.4W	1.01	1.01	3.21	2.91	2.21	1.61	1.41	1.41	3.31	5.21	15.61	4.11	4.91	7.91	4.71	2.31	0.21	1.41	10.41	1.81	2.51	5.81	3.71	1.61
CSBF1	29.7N	085.4W	2.21	2.81	2.61	4.01	2.61	2.41	2.21	1.51	2.11	10.41	6.31	14.71	15.31	1.91			0.11	0.11	5.61	3.71	4.05			
DBLN6	42.6N	079.5W	1.71	3.11	2.71	1.81	2.81	1.41	1.41	0.41	5.11	4.31	1.41	10.71	12.81	15.11	1.81	1.01	2.31	1.91		0.11	0.21	25.31	1.31	0.71
DISW3	47.1N	090.7W	1.71	3.61	2.81	1.01	0.81	2.01	1.11	1.61	5.41	17.11	8.81	3.11	2.81	9.51	4.21	2.21	1.11	3.11	2.51	0.51	1.91	14.81	3.31	1.31
FBIS1	32.7N	079.9W	0.51	0.31	0.91	1.51	2.11	1.41	2.81	2.61	2.81	1.31	6.41	11.21	26.31	10.21	6.41	1.01	0.11	1.21	4.71	2.51	3.11	7.91	0.61	
GLLN6	43.5N	076.3W	1.71	0.31	0.51	1.31	1.61	1.21	1.21	3.31	7.01	4.41	1.31	2.71	12.01	11.71	6.41	1.81	0.51	0.21	0.31	3.11	11.11	11.71	13.31	<.05
NWPO3	44.6N	124.5W	1.81	1.11	4.01	1.61	2.51	1.41	1.31	1.11	2.61	4.61	2.61	5.71	9.81	6.21	4.61	29.01	0.21			2.81	1.11	0.31	1.91	
PILM4	48.2N	088.4W	0.91	1.61	0.71	0.71	0.71	1.11	1.01	1.01	5.11	10.81	8.61	4.71	4.11	5.31	4.71	5.61	2.51	7.81	3.71	2.01	6.81	6.31	6.01	5.01
PTAT2	27.8N	097.1W				0.31	0.11							3.21	8.51	4.21	1.81				16.51	57.71	5.81	0.61		
PTGC1	34.6N	120.7W	1.01							0.61	10.91	0.11					0.31	4.01	45.11							3.91
ROAM4	47.9N	089.3W	1.51	1.31	0.81	1.21	2.81	1.11	0.91	1.41	2.91	9.61	3.81	4.51	4.21	4.11	2.61	2.21	4.11	11.51	1.41	3.61	1.41	5.61	10.01	3.81
SBIO1	41.7N	082.8W	2.31	1.51	1.11	1.41	2.01	2.61	2.01	3.21	9.01	6.41	5.31	3.41	5.11	3.41	5.31	0.91	0.61	0.81	3.61	8.81	13.61	8.71	5.11	
SGNW3	43.4N	087.7W	2.01	3.51	0.41	1.81	0.91	0.31	0.61	0.51	13.21	3.91	2.01	6.01	13.41	3.91	4.31	3.81	5.91	1.71	0.31	1.01	16.51	2.31	5.61	5.01
SISW1	48.3N	122.9W	0.31	0.21	0.81	1.51	2.11	3.51	4.11	2.81	0.71	0.31	0.71	4.11	4.51	7.91	25.01	1.91				0.81	0.51	7.71	28.51	0.11
SJLF1	30.4N	081.4W	0.71	0.61	0.31	0.91	0.21	2.51	3.71	1.51	1.31	4.51	8.31	14.91	4.91	9.71	13.31	4.61	0.11	2.31	3.41	15.51	4.51	1.81	0.41	
SRST2	29.7N	094.1W	1.01	0.61	0.21	0.31	0.71	0.51	0.81	3.21	0.81	0.31	0.51	8.61	23.51	9.01	3.11	1.91				15.01	22.91	5.21	0.31	
WPOW1	47.7N	122.4W	4.31	10.91	1.11	3.41	7.61	1.01	0.21	0.41	15.51	16.11	1.31	3.11	10.31	1.51			0.11	1.51	2.01		0.31	10.31	1.21	

JUNE 1984			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.21				1.61	1.31	1.41	3.71																
41002	32.3N	075.7W	0.11				0.41	<.05	1.31	1.31																
41006	29.3N	077.3W				0.11																				
42001	25.9N	089.7W																								
42002	26.0N	093.5W																								
42003	26.0N	085.9W	0.11	0.11	0.61	0.71				0.11																
42007	30.1N	088.9W		<.05	0.11				0.11	<.05																
42008	28.7N	095.3W				1.41																				
42009	29.3N	087.5W						0.11																		
42011	29.6N	093.5W				1.11	1.51																			
44005	42.7N	068.3W																								
44007	43.5N	070.1W		0.11																						
44008	40.5N	069.4W	0.31			<.05	0.11																			
44009	38.5N	074.6W	0.11							0.51																
44011	41.1N	066.6W				0.11				0.11																
44012	38.8N	074.6W						0.41																		
45001	48.0N	087.6W																								
45002	45.3N	083.4W					0.71																			
45003	45.3N	082.8W																								
45004	47.2N	086.5W																								
45005	41.7N	082.5W																								
45006	47.3N	090.0W																								
45007	42.7N	087.1W					0.31																			
45008	44.3N	082.4W																								
46011	56.3N	148.3W			0.11	0.61																				
46022	42.5N	130.3W						0.11	0.51		1.11															
46033	51.9N	155.7W						0.81	0.61	0.91	0.31															
46041	51.0N	136.0W				1.41	0.41	1.61	1.11																	
46066	40.7N	137.7W					0.21	2.41	1.71	1.61																
46011	34.9N	120.9W								0.31																
46012	37.4N	122.7W	1.31			0.11	0.41			6.41																
46013	38.2N	123.3W							7.31	27.51																
46014	39.2N	124.0W	1.01							10.91																
46016	43.3N	170.3W						0.41																		
46017	40.3N	172.3W			0.31	1.01																				
46022	40.8N	124.5W	2.61				0.11			0.21																
46023	34.3N	120.7W	1.91							46.21																
46024	32.8N	119.5W								1.31																
46025	33.6N	119.0W																								
46026	37.8N	122.7W							0.51	3.41																
46027	41.8N	124.4W				1.01			4.11	20.01								1.91	4.31							
46028	35.8N	121.7W								31.71																
46029	46.2N	124.2W				0.11																				
51001	23.4N	162.3W																								
BURL1	28.9N	089.4W					0.11	0.61									0.11									
CSBF1	29.7N	085.4W																								
DBLN6	42.6N	079.5W						0.61																		
DISW3	47.1N	090.7W	0.21	1.21	0.21		0.11	1.71									0.41									
FBIS1	32.7N	079.9W	0.41	<.05																						
GLLN6	43.5N	076.3W				0.31	0.61	0.31	0.31																	
NWPO3	44.6N	124.5W	1.21															1.91	4.31							
PILM4	48.2N	088.4W		0.21	0.51	0.21	0.71	0.91	0.71							0.11	0.31									
PTAT2	27.8N	097.1W				1.41																				
PTGC1	34.6N	120.7W	31.61							2.71																
ROAM4	47.9N	089.3W	1.31	4.01	0.71	0.31	1.21	1.21	3.01	0.91							1.11	0.11								
SBIO1	41.7N	082.8W					0.31	0.61	0.91	0.21																
SGNW3	43.4N	087.7W					0.81	1.91	0.51	0.21																
SISW1	48.3N	122.9W						0.21	1.61																	
SJLF1	30.4N	081.4W			0.11	0.21																				
SRST2	29.7N	094.1W		0.11		0.51	0.31																			
WPOW1	47.7N	122.4W																								

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